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OIL WORLD
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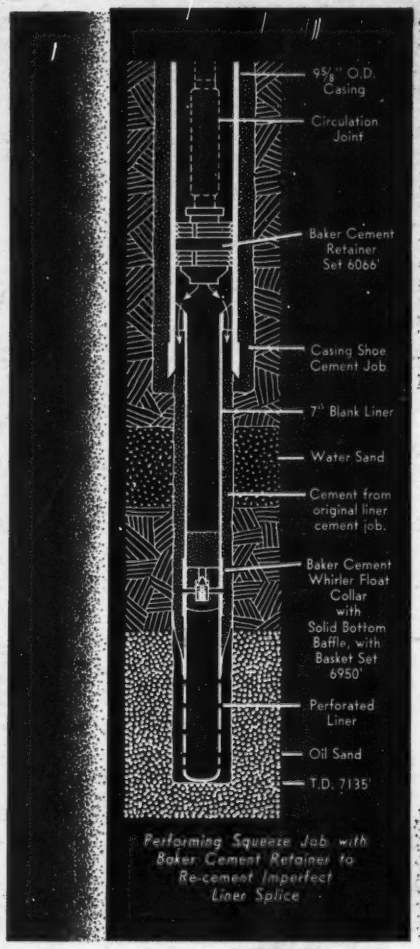
9⅝" O.D. Casing
Circulation Joint
Baker Cement Retainer Set 6066'
Casing Shoe Cement Job
7" Blank Liner
Water Sand
Cement from original liner cement job.
Baker Cement Whirler Float Collar with Solid Bottom Baffle, with Basket Set 6950'
Perforated Liner
Oil Sand
T.D. 7135'

Performing Squeeze Job with Baker Cement Retainer to Re-cement Imperfect Liner Splice

BAKER CEMENT RETAINER

CASE STUDY NO. 405

Problem: To Rectify a Wet Liner Splice.

Method: Set Cement Retainer above Splice and Perform Squeeze Cement Job.

Result: 100% Successful . . . Liner Splice Tested Dry.

• DETAILS •

Field: Montebello, Calif.
Depth of Well: 7135'
Depth Retainer Set: 6066'
Breakdown Pressure: 2000#
Final Pressure: 2400#
Number of Sax Mixed: 60
Number of Sax Put Away: 60
How Cement Discharged: through Retainer + around Liner Splice

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A Case study of an Actual Well Repair Problem Solved By Using the Baker Cement Retainer

BAKER ★ SAVE A WELL ★ CEMENT RETAINER

"For Friendly Service, and Dependable Products, Specify BAKER."

THE BAKER CEMENT RETAINER . . . has provided the solution to many Cementing, Well Repair, and Well Completion problems confronting the modern operator . . . Perhaps it will solve a particular problem confronting YOU. Complete details concerning its many practical field applications will be found in the Baker Section of the Composite Catalog . . . also in Baker Broadcast No. 17-A, a comprehensive, 40-page illustrated treatise which will be sent to interested oil men upon request.

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IMPORTANT CEMENT RETAINER APPLICATIONS INCLUDE:
Squeeze Jobs • Recementing • Cementing Behind Sections of Pipe • Reducing Gas/Oil Ratios • Series Cementing • Plugging off Bottom Fluids • Plugging back to Upper Zones • Testing Upper Cased Formations • As a Heaving Plug • As a Bridge Plug at any Place in Casing or Liner • Open Hole Acidizing • Open Hole Squeeze Cementing

BAKER CEMENT RETAINER

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has served the oil industry . . . thirty years in which Bowen
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everywhere—and because of this policy, has been able to
velop a line of rugged, efficient tools that are depend
under **all** types of conditions.

In its thirty years of service, Bowen has grown to be
largest and most complete service company of its kin
the West. Today, it has more service stores . . .
service men . . . more tools . . . and more rolling stock
any other fishing tool company in California!

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FIELDS. ★ TO SAVE TIME — CALL BO**

THE S. R. BOWEN COMPANY takes this opportunity to congratulate Union Oil Company on the fiftieth anniversary of its founding, and to extend wishes for many more highly successful years in the petroleum industry. Union's record of achievement in the West since 1890 reflects the excellent policies, fine personnel and solid foundation upon which the organization is built.

S. R. BOWEN CO.
VALLEY FISHING TOOL COMPANY

LANE-WELLS FIRST GUN PERFORATING JOB — STILL PRODUCING

Lane-Wells engineers have gained a vast fund of practical knowledge since they Gun Perforated an abandoned well in Montebello and restored it to production. They learned early that *safety* was of paramount importance to every operator so they developed complete surface control of the Gun and a five-point safety system to protect the operator's investment in the well. The need for *accuracy* led to the building of sensitive depth-measuring devices to make sure shots were placed exactly where they were wanted. *Power* to penetrate multiple strings of casing without damage was achieved with balanced powder charges and correctly designed alloy steel bullets.

In seven short years, packed with activity, Lane-Wells field crews have gained experience in almost every producing field from more than 25,000 successful Gun Perforating jobs for more than 2300 oil companies.

This combination of practical knowledge, and safe, accurate, powerful equipment plus field experience is the "reason why" operators say "It pays to call Lane-Wells."

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Everywhere

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CONTRACTORS ★ MANUFACTURERS

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Dust and Liquid Scrubbers

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California Oil World and Petroleum Industry is published twice a month at 828 Petroleum Bldg., 714 West Olympic Blvd., Los Angeles, California. Entered as Second-class Matter January 1, 1937, at the post office at Los Angeles, California, under the Act of March 3, 1879. Subscription price: $1 per year in U. S. and Possessions, $2 in foreign countries, including Canada. Member of the Audit Bureau of Circulations.

INSIST ON STANDARD DIESEL FUEL

Tops for power—engine protection—smooth operation

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It takes a thoroughbred engine and a stubborn, pigheaded, stay-in-there-and-pitch lubricating oil to defy old man "Wear Rate". But that's just what happened when New RPM DELO teamed up with a Hamilton Diesel in recent "exhaustive tests"!

After running at full load and full speed all the way, the test engine showed *wear so slight it was "hardly measurable"*. Good reasons why!—

Every ring was free—all oil rings unclogged. That alone prevented loss of power, high oil consumption, blow-by, piston and cylinder wear.

All bearings were free from corrosion—and bearing wear was stopped cold.

Carbon formation was exceptionally low—and *no* hard carbon. Not a sign of scratching or scoring on pistons, rings, liners, etc.

Filter clogging?—Absolutely none—in hundreds of full-load hours!

General Machinery Corporation finds this test "extraordinarily satisfactory". Prove New RPM DELO's cost-cutting, money-making performance for yourself—in any make or type of Diesel. You're passing up extra operating profits every day you don't!

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DIESEL ENGINE LUBRICATING OIL

New "RPM" Diesel Engine Lubricating Oil available everywhere in the gray barrel with the blue head

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WHEN YOU USE T-I-W

PRACTICAL OIL FIELD PRODUCTS *You Are Sure of* SUPERIOR PERFORMANCE

SERVING THE OIL INDUSTRY FOR NEARLY A QUARTER OF A CENTURY . . . with the . . . MOST COMPLETE LINE OF OIL FIELD PRODUCTS MANUFACTURED BY ONE ORGANIZATION.

T-I-W Lubricated Grief Stem SAFETY VALVES

This valve has an a vantage over drill ste float valves as circula tion is not restricted i any way, there being n obstruction in the dri pipe should same be come stuck and have t be cut from the inside Only one on the marke having a straight ac and sealing on both u per and down strea sides of body, elimina ing the possibility o sand working betwee plug and body, thereb causing same to freez

Patented T-I-W Regular Three-Piece Reliner Type Slip 13¼" Bearing Surface Against Pipe

Below: Showing the two halves of two-piece Slips, also liners for same. 13¼" bearing surface against pipe.

ALSO: T-I-W Long Reliner Slips for deepest wells.

T. I. W. SLIPS SAVE MONEY

BECAUSE:

1 With T-I-W Slips, the same housing can be used for many sizes of pipe.

2 Liners can be re-sharpened many times.

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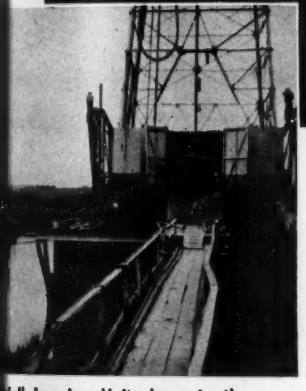
Complete LOGGING WHILE DRILLING

EVEN UNDER THE MOST DIFFICULT CONDITIONS



Well Logging Unit shown in these ows had to be floated on a barge o a Louisiana bayou to the well on.

BAROID WELL LOGGING SERVICE assures the operator accurate and immediate information on the oil, gas, and salt content, and the rate of penetration of the formation encountered during drilling operations. This information is obtained directly and continuously through drilling mud analysis rather than by deductive methods.

In drilling a well, the bit drills up and disintegrates a cylindrical core of the formation being drilled. If gas, oil or salt water are contained in the pore spaces of this core when it is drilled, the content of the pore spaces must of necessity be picked up by the drilling fluid. If the drilling fluid is continuously analyzed upon its return to the surface, and correlated with the depth from which the cuttings came, the gas, oil or salt content of the formation can be accurately determined.

In addition to all equipment for making these determinations, complete core analysis equipment is included in each Logging Unit to determine permeability and porosity of cores.

BAROID WELL LOGGING SERVICE has proved extremely valuable in:

1. Minimizing coring.
2. Correlating formations.
3. Determining oil-gas, oil-water contacts.
4. Locating points for casing and testing.
5. Detecting washouts before pipe failure.

Baroid Well Logging Units are available with trained operators, or trailers can be leased without operators. Illustrated literature on request.

See Our Exhibit
INTERNATIONAL PETROLEUM EXPOSITION TULSA MAY 18-25

our Exhibit

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ETROLEUM
EXPOSITION

OOTHS 83-84, 127-128
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ALSO OUTSIDE DISPLAY
WELL LOGGING UNIT
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BAROID SALES DIVISION
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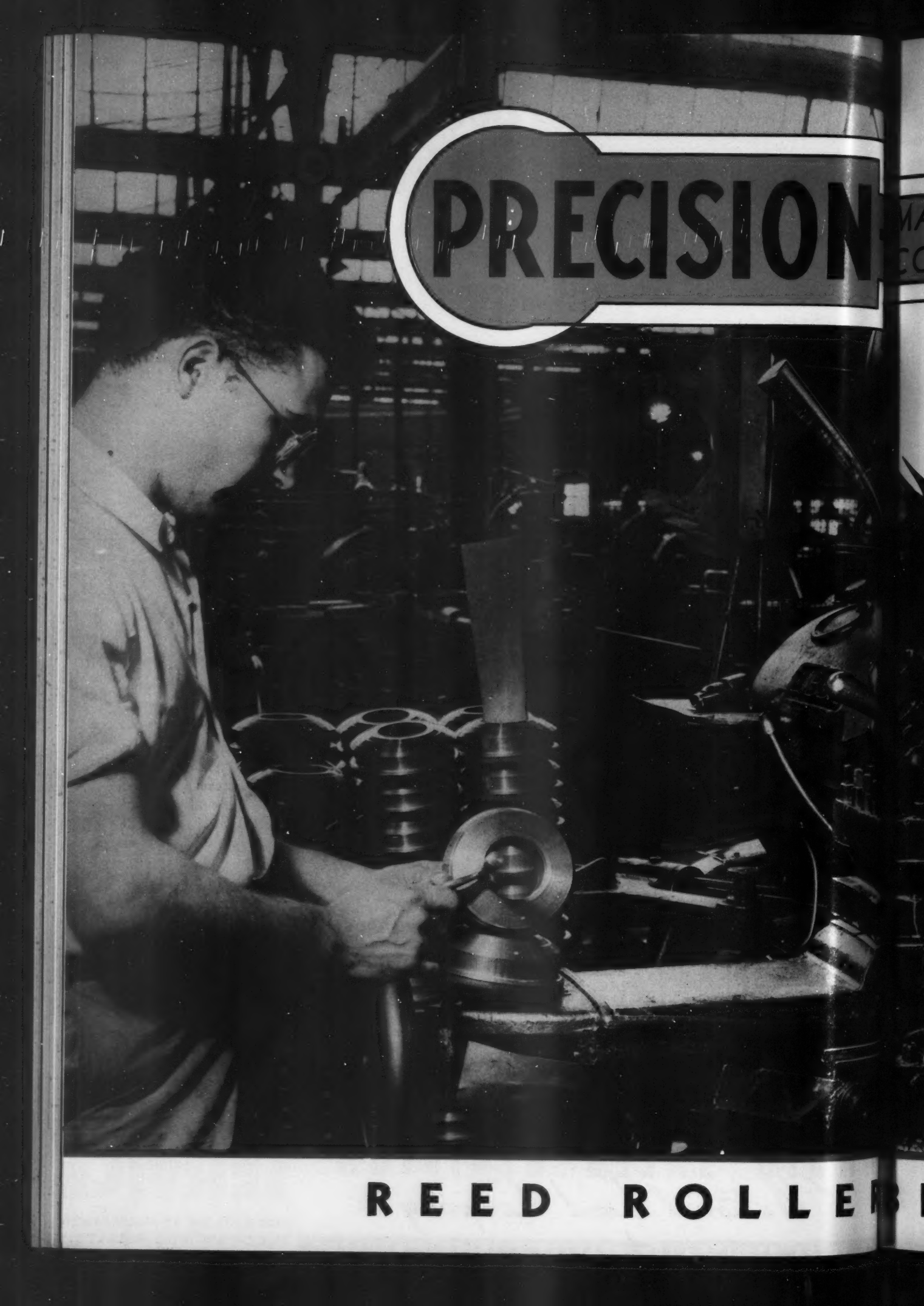
THROUGH MUD ANALYSIS

ID SALES OFFICES: LOS ANGELES · TULSA · HOUSTON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STRAIGHTER
FULL GAUGE HOLE

BIT COMPANY

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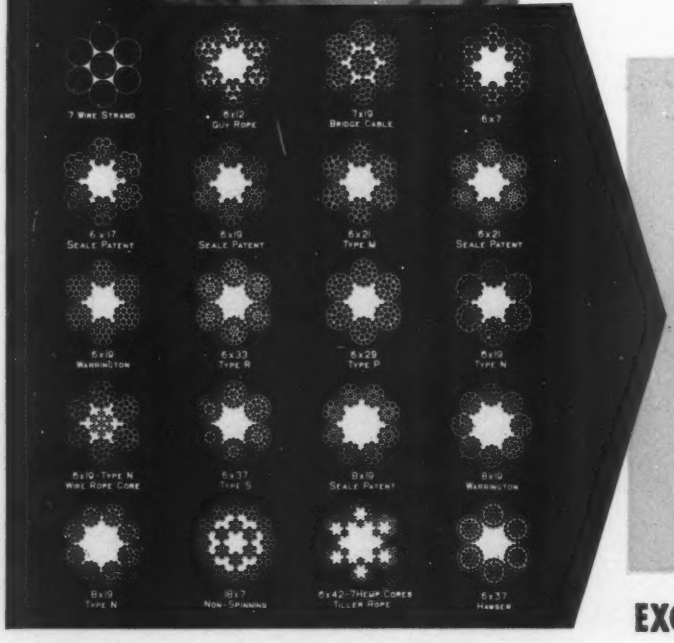

WHAT THIS PLUS VALUE MEANS TO YOU

Pictured opposite are cross-sections of twenty different constructions of wire rope — there are many others manufactured in various grades; standard and preformed. Each is designed to do a particular job — here is where the "Tiger Brand" wire rope expert comes in. Working with you, he knows the demands that are to be made on the rope and his competent advice assures you a "Plus Value" wire rope. Call him.

EXCELLAY *Preformed* WIRE ROPE

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AMERICAN STEEL & WIRE COMPANY
Cleveland, Chicago and New York
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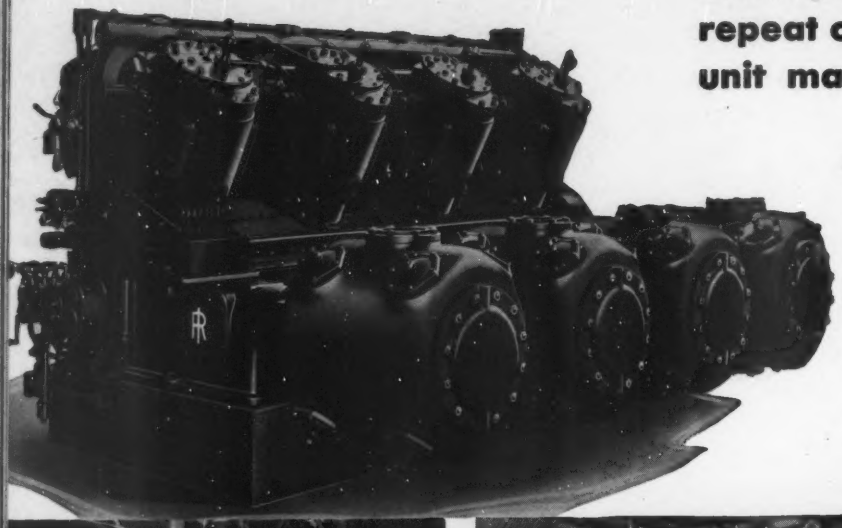
SIX TYPICAL USES OF THE XVG COMPRESSOR—

Each plant illustrated brought a repeat order. This gas-engine-driven unit may solve your problems, too.

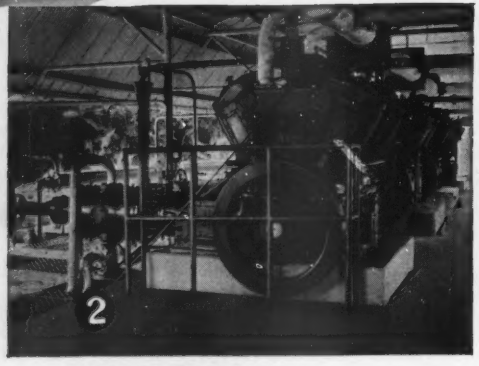


- The XVG is the original multi-cylinder gas-engine-driven compressor. Its wide use is conclusive evidence that it meets the needs of the petroleum industry. Repeat orders make up a sizeable proportion of the installations now totaling more than 150,000 hp.

A representative of the nearest Ingersoll-Rand branch office will be pleased to tell you the full story of the XVG.

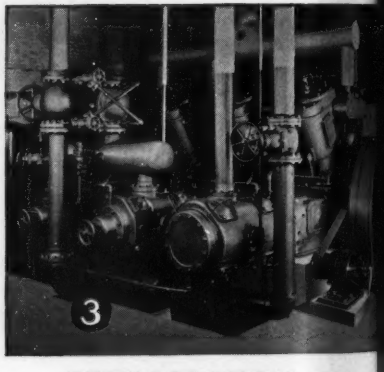
GASOLINE EXTRACTION— Ten 3-stage 8-XVG gas compressors in a natural gasoline plant.

GAS LIFT— An XVG Compressing natural gas to 300-lb pressure for gas lift service.



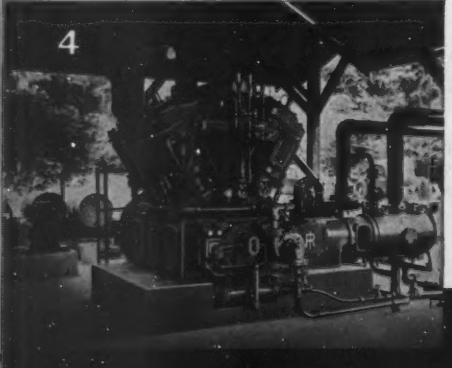
REPRESSURING— Four XVG compressors supplying 2000-lb gas for repressuring service.

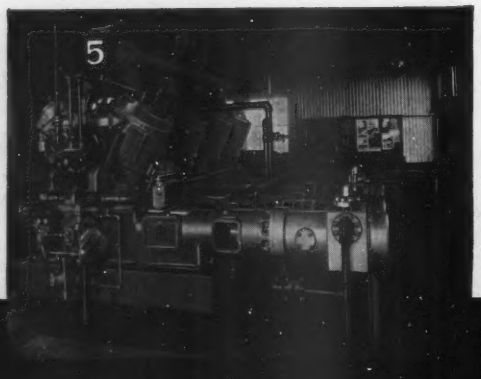
RECYCLING—Two 8-XVG compressors in recycling service. Gas at intake 1800 to 2450 lb, discharge 3600 lbs.

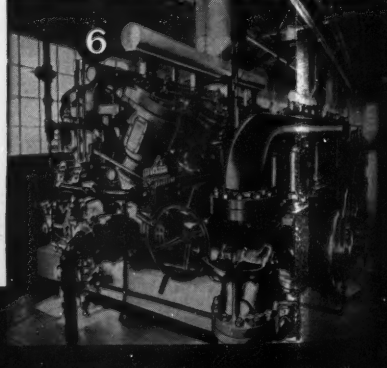


REFRIGERATION—Two ammonia cylinders produce 130 tons refrigeration; air cylinder delivers 20-lb agitation air.

GAS BOOSTING—Four 8-XVG compressors boosting natural gas in a pipe line station.







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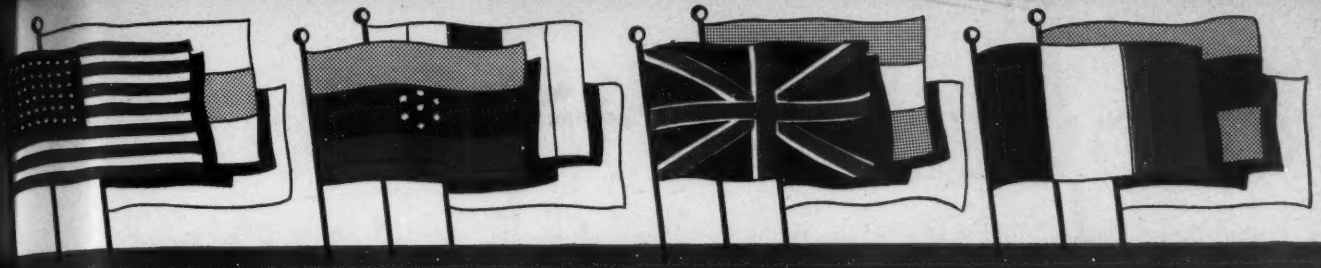
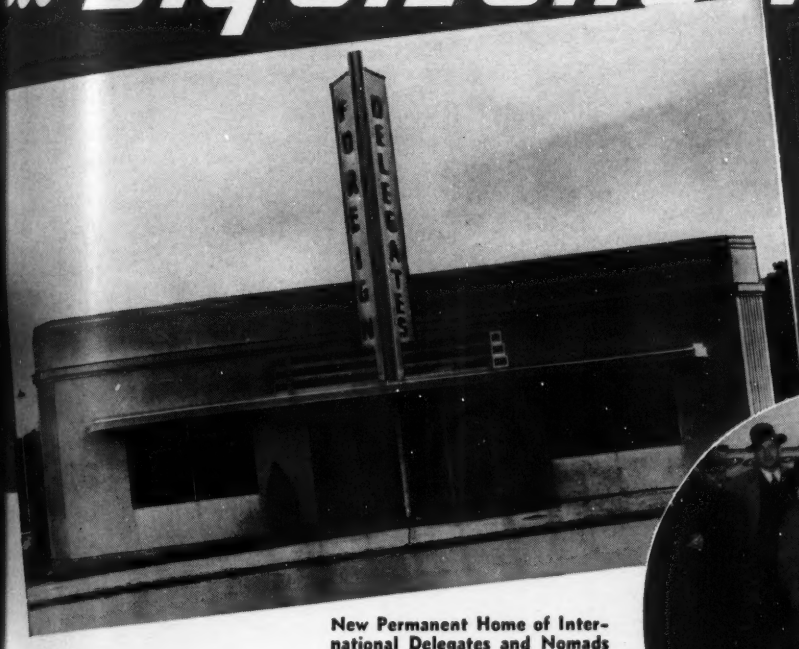


NOMADS call world conclave at Big OIL SHOW in TULSA

INTERNATIONAL DELEGATES TO BE GUESTS OF NATIONAL OIL-EQUIPMENT MANUFACTURERS AND DELEGATES SOCIETY (Nomads)



New Permanent Home of International Delegates and Nomads

Nomads Break Ground for New Home

International Delegates to the "World's Fair of the Oil Industry" to be held in Tulsa, U. S. A., May 18-25, 1940, will be the special guests of the Nomads, members of the National Oil-Equipment Manufacturers and Delegates Society who have had foreign service in the oil industry. The members of the Houston, Los Angeles and Tulsa chapters have joined hands with the Exposition management to provide many special attractions and accommodations for all overseas visitors.

SPECIAL FEATURES FOR INTERNATIONAL DELEGATES

- **NEW CLUB BUILDING** — The new International Delegates Building and Nomads Club headquarters will be completed for Oil Show.
- **SPECIAL TOURS** — Personally conducted trips to Oil Fields and Refineries.
- **INTERNATIONAL BANQUET** — An Elaborate Fellowship Dinner is being arranged.
- **FREE AUTO TRANSPORTATION** — Special automobile service to Show Grounds and Points of Interest in Tulsa.
- **HOUSING RESERVATIONS** — Secured Through Housing Committee in Advance; or at Headquarters During Exposition.

Write WM. B. WAY, General Mgr., For Information

TULSA MAY 18—25

INTERNATIONAL PETROLEUM EXPOSITION

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This clutch enables "Cardwell" rigs to "drill-up" through cave-ins, eliminates 90% of the hazard of stuck tools and stops the destructive shock and pounding of jaw clutch engagement.

Over 480 in Use Since 1936 Without a Breakdown or Part Failure

The "Cardwell" friction clutch can be slipped without wear or heating and may be engaged quickly or slowly as the job demands.

Every wearing part is heat-treated. There is nothing to wear out but the 3/8"x6" standard lining that can be purchased anywhere.

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No time is lost in engaging friction clutches. They pick up the load without grabbing or jerking and hold firmly when fully engaged.

The clutch lining can be changed in 1 hour without removing the clutch from the shaft. This is a simple wrench job and requires no special tools.

Friction clutches on the countershaft are standard equipment on "Cardwell" draw works, combination drilling rigs and double drum servicing hoists.

The clutch brake automatically engages when the clutch is disengaged, quickly stopping the rotation of the clutch.

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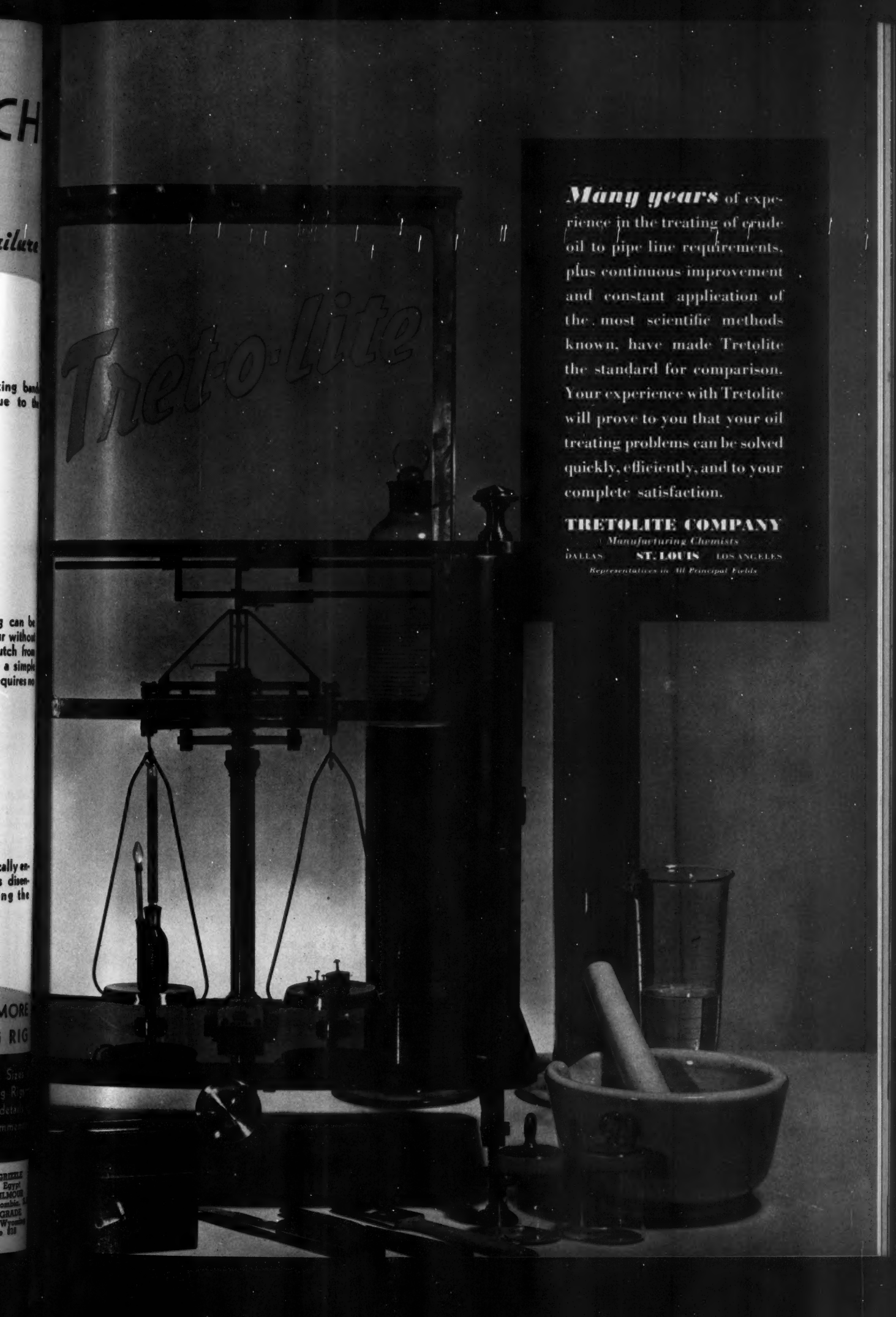

Many years of experience in the treating of crude oil to pipe line requirements, plus continuous improvement and constant application of the most scientific methods known, have made Tretolite the standard for comparison. Your experience with Tretolite will prove to you that your oil treating problems can be solved quickly, efficiently, and to your complete satisfaction.

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Representatives in All Principal Fields

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CALIFORNIA
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THE AUTHORITY ON THE CALIFORNIA OIL INDUSTRY

SECOND ISSUE
APRIL 1940
VOL. 33 NO. 8
WHOLE NO. 1559

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April 25, 1940

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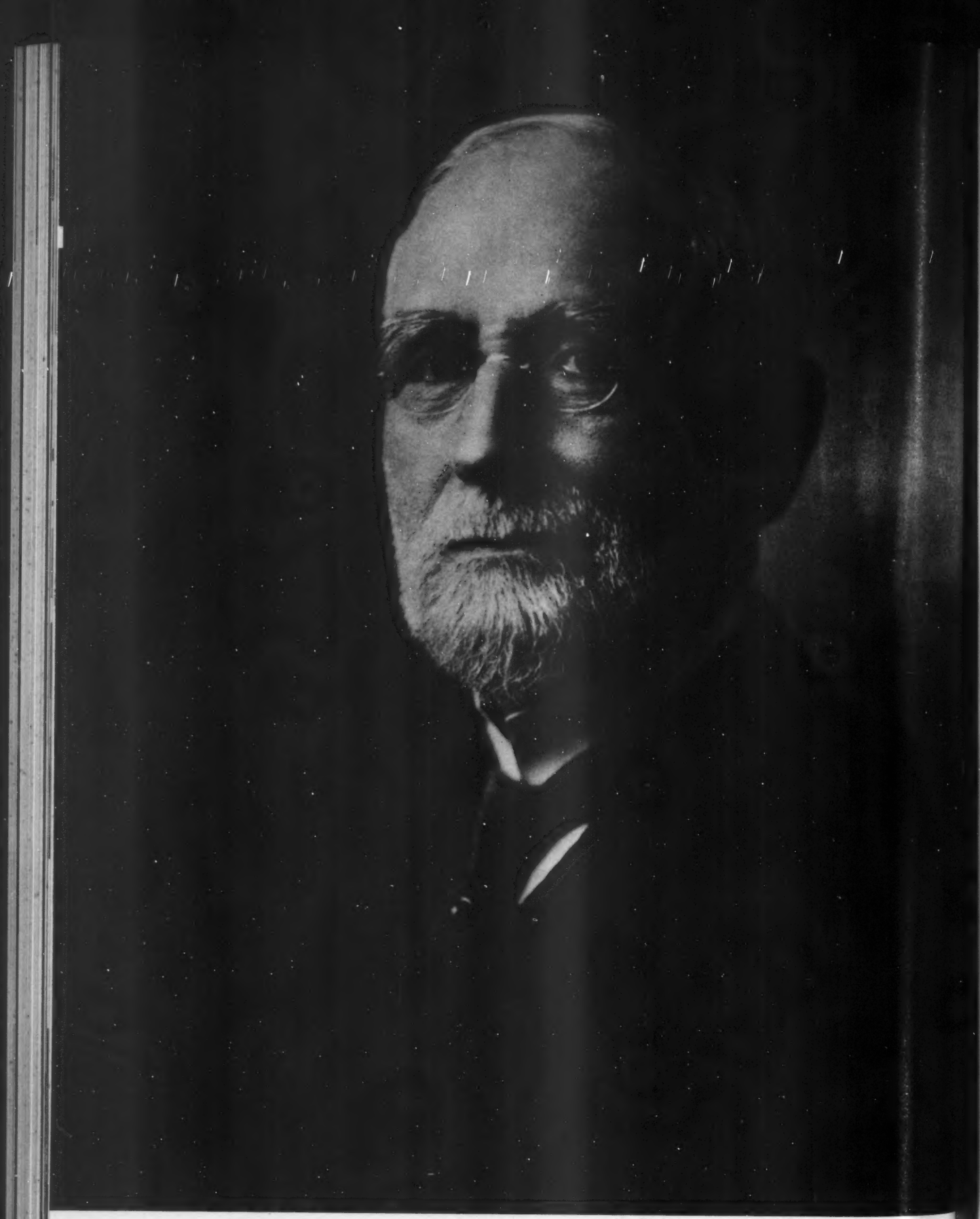


Lyman Stewart
Co-founder
President, October 8, 1894—April 30, 1914

Union Oil Company of California

1890 1940

A significant episode in the pioneering effort that eventually brought the rugged, unexploited territory west of the Rockies into the American economic scheme, Union Oil Company of California was founded on October 17, 1890, in the little town of Santa Paula, California.

No mere accident was this event. Long before 1890 Fate had begun shaping the circumstances that led to the organization. With the birth of the petroleum industry in 1859, there was conceived in the mind of Lyman Stewart, young native of Cherrytree, Pennsylvania, an idea—a dream by which he was actuated for the remainder of his life. His dream was of the transformation that this substance, called petroleum, was to bring about in the lives of men. He foresaw the demand that its potential power was to provoke, and the opportunity that was thus to be presented for public service—and, no doubt, personal profit.

The world famous experiment of Colonel Drake was conducted within a very few miles of Lyman Stewart's home. Its success was undoubtedly the source of his inspiration. In any case, it is certain that no sooner had the feasibility of the exploit been established, than Lyman Stewart launched into the new enterprise with all the enthusiasm of which a nineteen year old youth is capable.

First Oil Venture

His first venture was a one-eighth interest in a five acre lease on the banks of Oil Creek near Titusville, Pennsylvania. It was subsequently sublet before any actual drilling was attempted. This property was later the scene of a spectacular robbery, in which thieves escaped with the tidy sum of $210,000—just a part of the royalties—accumulated by John Benninghoff, the lessor.

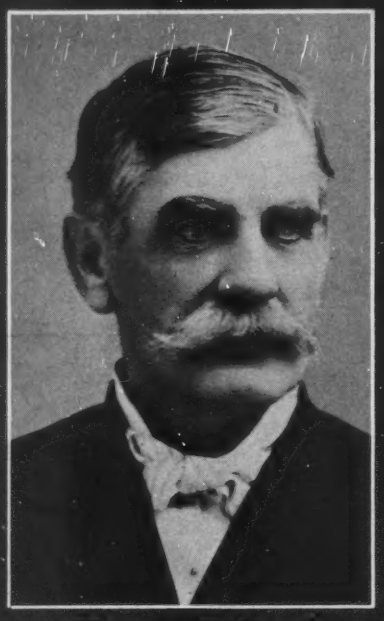
The first few years of operation in Pennsylvania were far from productive for Lyman Stewart. It was not, in fact, until his discharge from the Army of the Potomac at the conclusion of the Civil War, in 1865, that Lady Luck cast him a fleeting smile. In the six years following he succeeded in amassing as a result of his efforts in the oil fields some $300,000—a sizable fortune even by our present standards of measurement. His luck was short lived. Two years later a disastrous investment in a machinery plant had stripped him of his wealth, and he was obliged to take a position at a small salary in order to provide the necessities for his family.

In his very misfortune, however, may be seen the first direct step towards the ultimate formation of Union Oil Company, for it was during this period of trial that the initiation of the Hardison-Stewart partnership occurred. Some years previously Lyman Stewart had befriended two of the Hardison brothers, and Wallace hadn't forgotten. In 1875 he sought out the benefactor, and with him entered into a compact of friendship, that remained unbroken until Hardison's death in 1910.

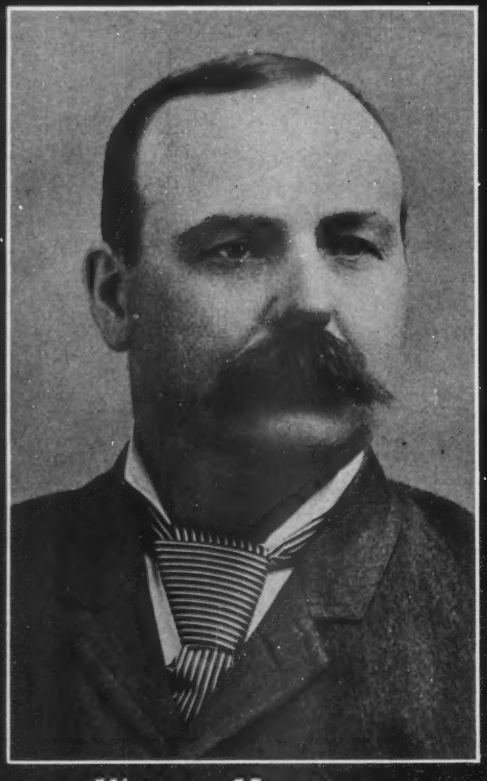
News of Oil in California

The pair carried on very successfully for a number of years, leasing, drilling and producing. But certain restricting influences interfered with their plans and ambitions. They found themselves gradually being forced into a subservient position by larger interests. When word began to arrive, therefore, of oil discoveries in California, and of the futile efforts of inexperienced operators to bring it to the surface, Lyman Stewart was much intrigued. Late in 1882 he shipped two drilling rigs to Santa Paula, California, and in April of the following year arrived himself on an exploration trip.

He quickly found that the reports he had heard were based on fact and that the stretch of territory lying between Newhall and Santa Barbara had all the known surface indications of rich petroleum deposits.

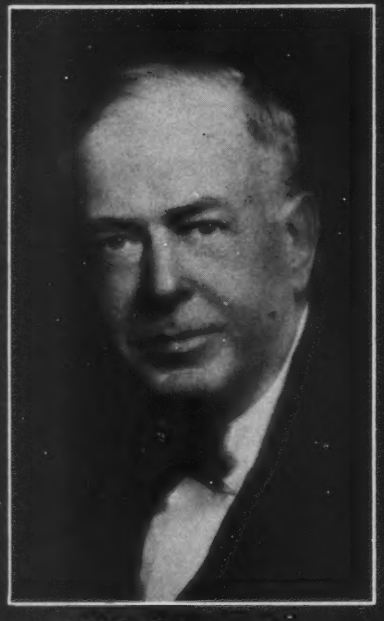


Thomas R. Bard
PRESIDENT OCT. 18, 1890 - JULY 24, 1894

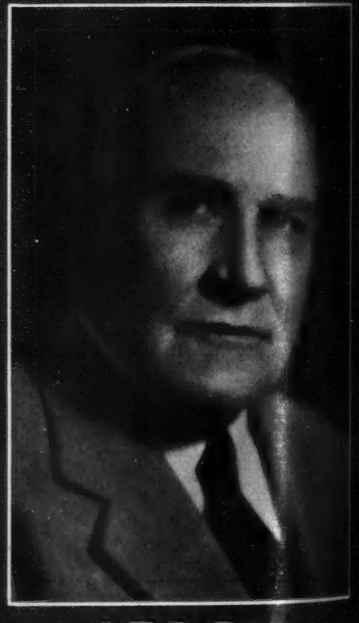


Wallace Hardison
CO-FOUNDER OF THE COMPANY

D. T. Perkins
PRESIDENT JULY 24, 1894 - OCT. 8, 1894

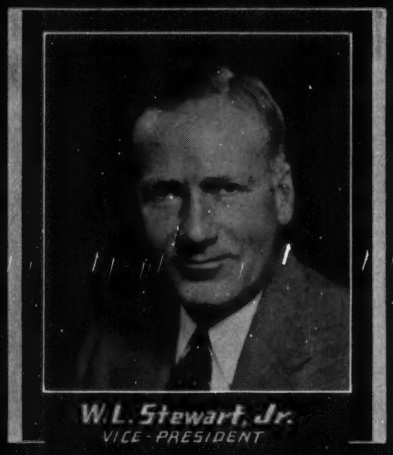


W. L. Stewart
PRESIDENT APRIL 30, 1914 - JUNE 21, 1930

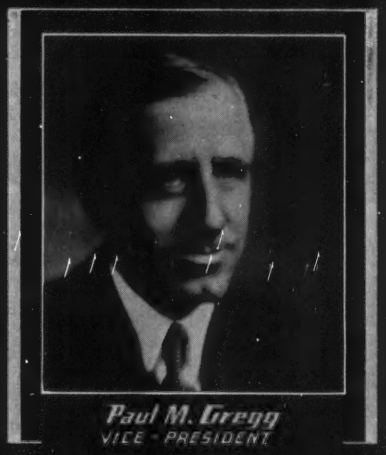


L. P. St. Clair
PRESIDENT JULY 7, 1930 - OCT. 24, 1938

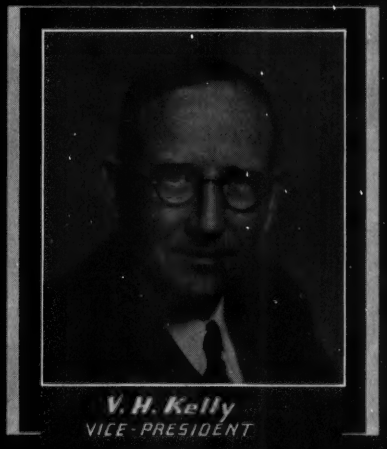
Reese H. Taylor
PRESIDENT



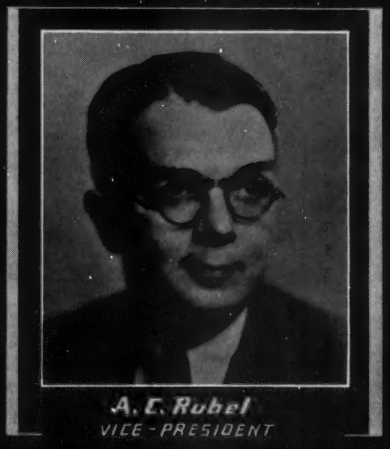
W. L. Stewart, Jr.
VICE-PRESIDENT



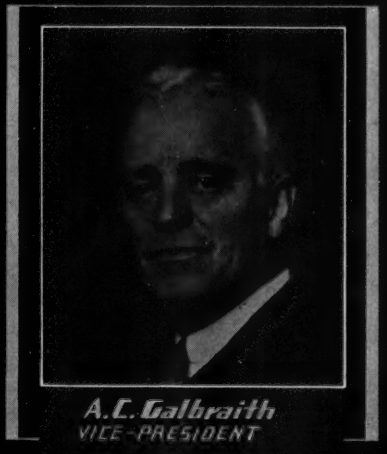
Paul M. Gregg
VICE-PRESIDENT



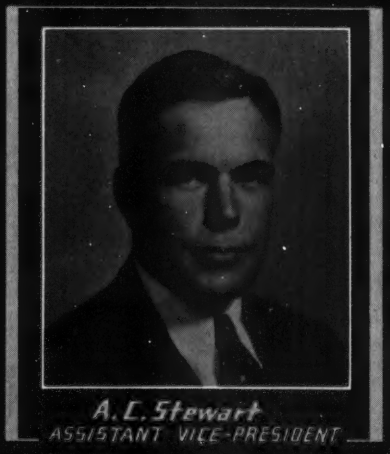
V. H. Kelly
VICE-PRESIDENT



A. C. Rubel
VICE-PRESIDENT

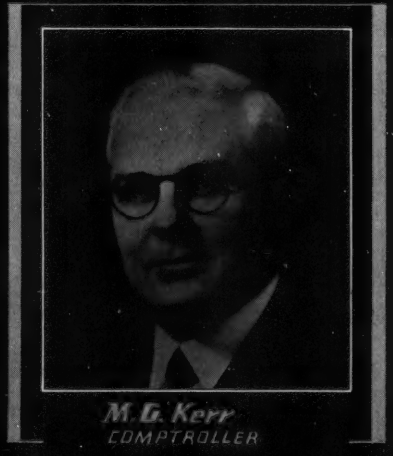


A. C. Galbraith
VICE-PRESIDENT

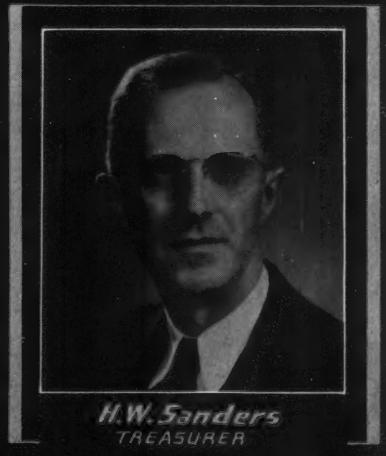


A. C. Stewart
ASSISTANT VICE-PRESIDENT

W. R. Edwards
SECRETARY



M. G. Kerr
COMPTROLLER



H. W. Sanders
TREASURER

LAKE VIEW NO. 1

With his usual promptitude he immediately wired W. L. Hardison to liquidate their Pennsylvania holdings, and come West. The latter did so, first crating all the drilling machinery and equipment they had used in their eastern operations, and sending them on ahead. So in 1883 we find Hardison and Stewart in California, striving once again in a new and strange environment to find a permanent place in the young industry to which they had dedicated themselves. It is interesting to contemplate that Lyman Stewart was by no means a young man when he voluntarily abandoned his home state, and started life afresh in what was then believed to be a wild, lawless, unbridled country. The fact that he had reached the age of 43 when he made this drastic decision gives some idea of his pertinacity and courage.

In these pioneer days actual field operations were confined to the land in the vicinity of Santa Paula and Newhall, and it was in the latter area that the partners commenced drilling.

Expensive Beginning

Along with their equipment, they had brought to the coast a number of experienced Pennsylvania drillers. Expense of the primary California projects was thus very high. Four dry holes on Christian Hill, near Pico Canyon, cut deeply into their resources, and it looked as if they were doomed to failure. The fifth, Star No. 1, came in for a fair yield, but only after funds were practically exhausted. Too late to lift the partnership out of a serious financial predicament, the event was nevertheless encouraging. On the strength of it a Los Angeles banker was prevailed upon to advance money for further operations.

It wasn't much, but it was sufficient to turn the tide in a very critical stage of the Hardison and Stewart progress. Thereafter, although frequently faced with tremendous obstacles, it is doubtful if ever again these pioneers found themselves so deep in despair as they did in those dark days of the middle eighties.

Pico Canyon

While they continued drilling in Pico Canyon they maintained headquarters in a small frame building near the railroad tracks in Newhall. As they met with further successes they began the acquisition of new leases in the neighborhood of Santa Paula, and eventually moved into temporary headquarters there.

First Real Success

Most important among these new leases was the Ex Mission property, which included Adams Canyon. It was here that the first really substantial quantities of oil were produced, and Hardison and Stewart began to lay a stable foundation for their future efforts.

The first three wells drilled to very shallow depths (70 to 275 feet) yielded nothing of consequence, but No. 4 and subsequent projects at depths ranging from 300 ft. to 2745 ft. rewarded the pioneers with yields varying from 5 to 300 barrels a day.

Incorporations

About this time Hardison and Stewart began to widen the scope of their operations. In 1886 they incorporated the Sespe Oil Company, with a capitalization of $100,000. Shortly afterwards the original partnership of Hardison and Stewart was terminated, and their business incorporated under the name of Hardison & Stewart Oil Company. The incorporators were Wallace L. Hardison, Lyman Stewart, Thomas R. Bard, Dan McFarland, Walter S. Chaffee, Alexander Waldie, John Irwin, J. H. Warring and Casper Taylor.

In order to facilitate field operations, another subsidiary, the Santa Paula Hardware Company was formed to purchase equipment and to sell drilling equipment to other companies less favorably situated. Alex Waldie was placed in charge of the company, which later grew into the Union Tool Company, one of the largest oil tool concerns in the United States.

The problem of production was now fairly well solved. Refining and distribution, however, presented plenty of difficulty. As early as 1886 it became apparent that broader markets must be secured, even for the limited products then available. The population of Los Angeles was still below 50,000, and the remainder of the territory south of the Tehachapi was only sparsely settled. Conditions were slightly better in the northern part of the state, San Francisco being the most promising market of the day.

Marketing California Kerosene

Coal oil manufactured from coal, and sent to the United States from Scotland was a major competitor of kerosene. Despite the distance, and difficulty of transportation, the East was also able to take a large share of the kerosene business from Western refiners. In fact, it was popularly believed that because of the inherent quality of California petroleum, its products could furnish little competition to the Eastern marketers.

There were no automobiles in those days. Steamships and trains still stuffed their fireboxes with coal. Country roads were mere cow-paths. Gasoline was a nuisance, and the product most in demand was kerosene for the national lamp. California kerosene was smoky, smelly, charred lamp-wicks, and dangerous, because of the presence of light vapors. These vapors mixed with the air in the lamp chimneys and became highly explosive under the right circumstances.

A Technical Achievement

This was the situation that had western refiners feeling anything but optimistic. Lyman Stewart, however, although lacking the academic training of the modern scientist, had the searching mind of the philosopher. He refused to be intimidated by the opinions of pseudo experts. He was unable to stand idly by and accept

LAKE VIEW NO. 1

the prevailing theory that California petroleum was inferior. Experiments were conducted, chemists were employed, the essential qualities of a clean, slow burning, efficient illuminant were determined, and the California product was quickly improved and accepted.

Meantime the operations of Lyman Stewart and his associates were expanding. A small refinery was built in Santa Paula in 1887. The improved kerosene began to find a market beyond the confines of Southern California. On May 31, 1889, the Torrey Canyon Oil Company was incorporated. Of this Hardison and Stewart owned a one-third interest.

New Products Developed

The combined activities of the Hardison & Stewart Oil Company, the Sespe Oil Company, and the Torrey Canyon Oil Company now accounted for an annual production of approximately 60,000 barrels of crude oil. The Hardison & Stewart Oil Company had instituted in 1887 one of the first petroleum research laboratories in the West. Under the direction of Dr. Salathe, an eminent chemist of the day, a printers' ink had been manufactured from petroleum. Several new lubricants had been perfected. Kerosene had been greatly improved. Asphalt had been adapted to several new uses.

Pipeline to Tidewater

In the same year, C. A. Burrows laid a 17-mile pipeline from the company's refinery at Santa Paula to tidewater at Ventura, believed to be the first seaboard trunk line constructed on the coast. A 6500-barrel wooden tanker, the **W. L. Hardison,** was build in 1880 for the firm. It was destroyed by fire within a year, but it lasted long enough to demonstrate the practicability of the idea.

Progressive developments were following each other fast. The three Santa Paula companies were so closely interrelated, and their operations so interdependent, that consolidation was almost a foregone conclusion.

Union Oil Company of California Formed

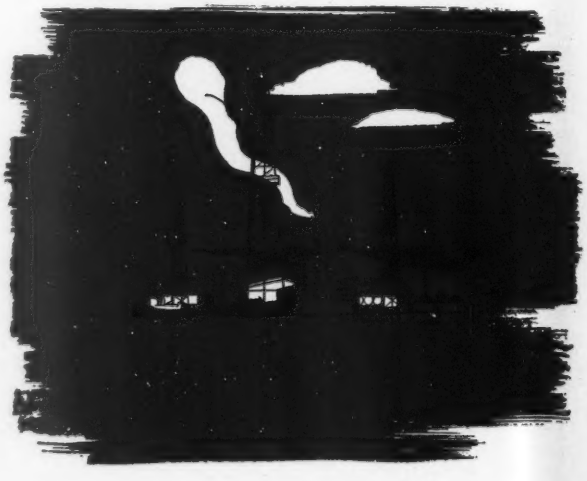
On October 17, 1890, in a little office on the second floor of the Santa Paula Hardware building, representatives of these pioneer companies formally pooled their resources and their talents. **And so came into being Union Oil Company of California,** an independent oil producing, refining, and marketing organization. Founded in 1890—but dating back in experience to the beginning of the industry in 1859.

The three parent companies were disincorporated, and their assets converted into Union Oil Company of California stock. The new company was capitalized at $5,000,000. Thomas R. Bard was elected first president.

Thomas Bard was born at Chambersburg, Pennsylvania, on December 8, 1841, and began the study of law there at the age of 17. He was compelled by ill health to seek outdoor employment, and worked for some time with the Cumberland Valley Railroad. Served with the Union Army during the Civil War. Was captured by Confederates and sentenced to execution, but rescued in the nick of time by Union cavalry. Came to California in 1864 as emissary of Colonel Thomas A. Scott, Secretary of War, to take charge of extensive California holdings. Held up in 1874 by highway robbers. Blazed his way out of danger with an old derringer. Served on Ventura Board of Supervisors 1867-1871. Elected U. S. Senator at Special Session of the Legislature in 1900. Held office until 1905. Very successful business man. Interests—oil, banking, colonization and sugar. The town of Bardsdale is named in his honor. Was regent of the University of California. A noted horticulturist—his home in Hueneme was a veritable floral paradise. Retired from the presidency of Union Oil Company in 1894. Died March 5, 1915, at age of 73.

Stewart Finds New Markets

During the first few years after the foundation of Union Oil Company, the industry was seriously men-



aced by overproduction. Here again Lyman Stewart assumed the responsibility of finding new markets. For several years considerable attention had been devoted to the use of crude oil as fuel. It is hard to believe that coal and wood were ever used to fire the boilers of the drilling outfits in the oil fields. Coal cost $30 a ton. A burner was developed back in 1886, and

since that time Hardison & Stewart boilers had all been fired with oil. Ships had been adapted to fuel oil in 1887, although its use for this purpose was by no means general.

Fueling the Locomotive

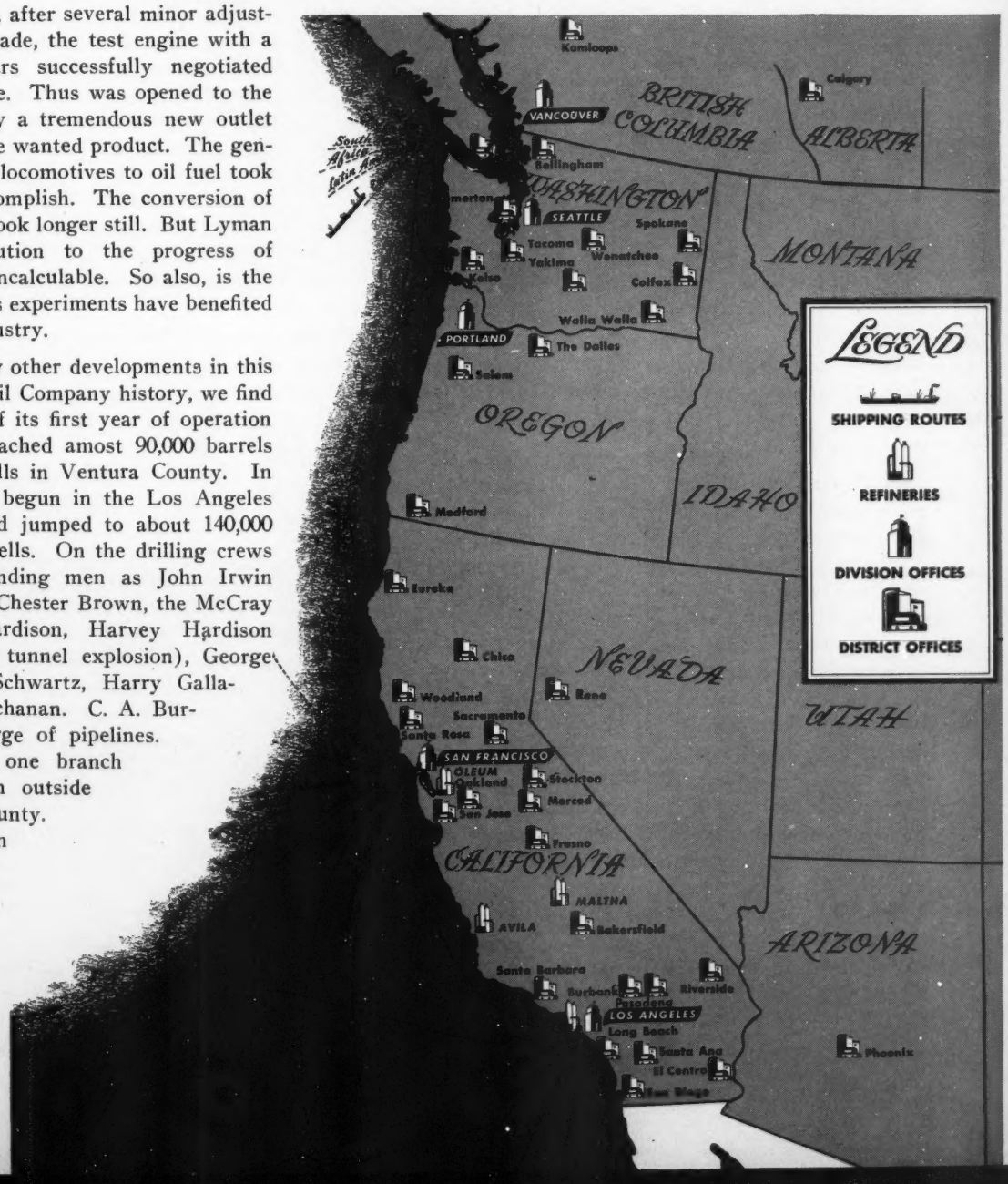
Sporadic attempts had been made to develop an oil burner for locomotives. Some success had been achieved in small scale experiments in Peru in 1887, and there were reports of success in Russia. It was not, however, until the conclusion of Lyman Stewart's now famous experiment in 1894 that the commercial feasibility of the oil burning locomotive was indisputably established in the United States. Working in cooperation with officials of the Southern California Railway Company, which later became part of the Santa Fe System, an engine was fitted with an oil tank. Burners were installed—several types, before a final decision was reached. Then in October 1894 came the first test run. It wasn't altogether satisfactory, but it indicated definite possibilities. A few weeks later, after several minor adjustments had been made, the test engine with a full string of cars successfully negotiated tough Cajon Grade. Thus was opened to the petroleum industry a tremendous new outlet for a formerly little wanted product. The general adaptation of locomotives to oil fuel took some years to accomplish. The conversion of steamships to oil took longer still. But Lyman Stewart's contribution to the progress of transportation is incalculable. So also, is the extent to which his experiments have benefited the petroleum industry.

Considering now other developments in this period of Union Oil Company history, we find that by the end of its first year of operation production had reached amost 90,000 barrels of oil from 26 wells in Ventura County. In 1892 drilling was begun in the Los Angeles area and the yield jumped to about 140,000 barrels from 33 wells. On the drilling crews were such outstanding men as John Irwin (superintendent), Chester Brown, the McCray brothers, Ed Hardison, Harvey Hardison (later killed in a tunnel explosion), George Fleischer, Dave Schwartz, Harry Gallagher, and Jim Buchanan. C. A. Burrows was in charge of pipelines. There was only one branch marketing station outside of Ventura County. That was at San Pedro.

In 1894 Thomas Bard resigned the presidency, and D. T. Perkins was elected interim successor. A native of Akron, Ohio, David Perkins came to California in 1879. He was associated with Senator Bard in various land enterprises, and was a large stockholder of Union Oil Company during the first few years of its existence. His career as president only lasted three months, when he retired. He was followed in the chief executive office by Lyman Stewart, the founder, and guiding genius of the organization since its inception.

Lyman Stewart Heads Union

"The Father of Western Petroleum," as Mr. Stewart was known affectionately to the industry, was a man of unusual qualities. Starting to work at the age of 11, he was denied the advantages of a collegiate education, but was inherently possessed of a keen analytical mind and a remarkable business ability. Despite years of contact with the rugged adventurers of the oil



fields, he remained to the end of his life the gentlest of souls. Through all the vicissitudes of a strenuous existence, mostly in settings ill adapted to spiritual reflection and religious practice, he adhered rigidly to the simple tenets of his early biblical training. He gave generously to the work of his church and held tenaciously to its teachings.

It was this very tenacity to his beliefs that finally earned Lyman Stewart a permanent niche in the industrial hall of fame, for it carried him to a generous realization of his ambitions. It was unquestionably the influence that eventually placed Union Oil Company of California on a firm enduring foundation.

Los Angeles Basin Operations

Immediately following his installation as president, the company extended its field operations into the Los Angeles Basin, beginning in the Olinda field in Orange County. In 1896 a four-inch pipeline was laid from Olinda to Los Angeles, and the following year a six-inch line to East San Pedro was completed. Two small pump stations were built at Norwalk and Brea Canyon. These conveyed oil to Los Angeles where delivery was made to city customers by tank wagon.

Hill and Orcutt

In this era of development two young men who were later to distinguish themselves in many ways became associated with the organization. Frank F. Hill had not yet become a permanent employee, but in 1895, although only 16 years of age, was already doing occasional jobs for Union Oil Company. In the same year W. W. Orcutt graduated from Stanford University —with the first graduating class, of which, incidentally, Herbert H. Hoover was also a member. Setting up headquarters in Santa Paula, Mr. Orcutt began the practice of civil engineering and was soon engaged in sundry enterprises for Union Oil Company. He was persuaded to join the staff as superintendent of development for the San Joaquin Valley division in 1898. One year later Frank Hill began his association with the company in the warehouse at Santa Paula, loading supply wagons for the wells at Adams, Saltmarsh, Torrey, Sespe, and Bardsdale Canyons. These men, Orcutt and Hill, are perhaps the best known tandem of field men in the industry. Alike in many respects, they spent forty years together, and together contributed much to the progress of exploration, drilling, and producing methods.

Achievements

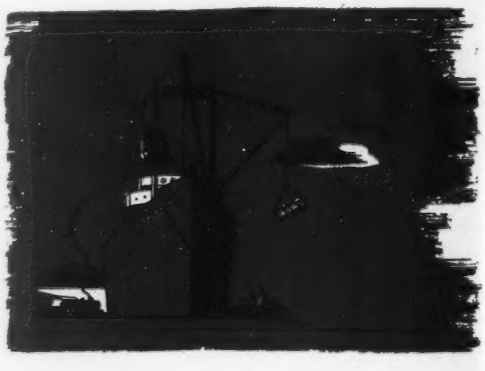
W. W. Orcutt instituted for Union Oil Company the first petroleum geological department in the West, and perhaps in the United States. He made the first geological survey maps of much California territory, and is credited with the discovery of a number of the state's richest producing fields. Lompoc, Santa Maria, Richfield and Santa Fe Springs are some of his finds. In the Los Angeles Museum, the Smithsonian Institute, and other noted repositories of educational exhibits, are to be found over 300 specimens of prehistoric animals discovered by Mr. Orcutt in the La Brea pits on the Hancock Ranch. This collection is reputed to be the greatest aggregation of fossil birds and animals ever uncovered in any one location.

Frank Hill has been a constant contributor to the development of drilling in almost every stage of its progress. He is believed to be the first to introduce cement for water shut-offs. His first experiment was with Hill No. 4 in Santa Barbara County in 1905. It flowed for over 30 years. Cementing is now, of course, a common practice in the industry, and has made possible many subsequent developments, notably deep drilling. Sub-surface circulation, gas lift, straight hole drilling, and many other significant modern developments have either been instituted by Frank Hill or have been improved through his experimentation.

Returning again to the chronological record, 1900 saw the extension of field operations into the Brea district and production rose to approximately 250,000 barrels annually.

Purchase Oleum Site

In the early nineties it became apparent that with increasing sales and a rapidly broadening market, it would soon be necessary to enlarge the company's refining facilities. Sales expansion in the San Fran-

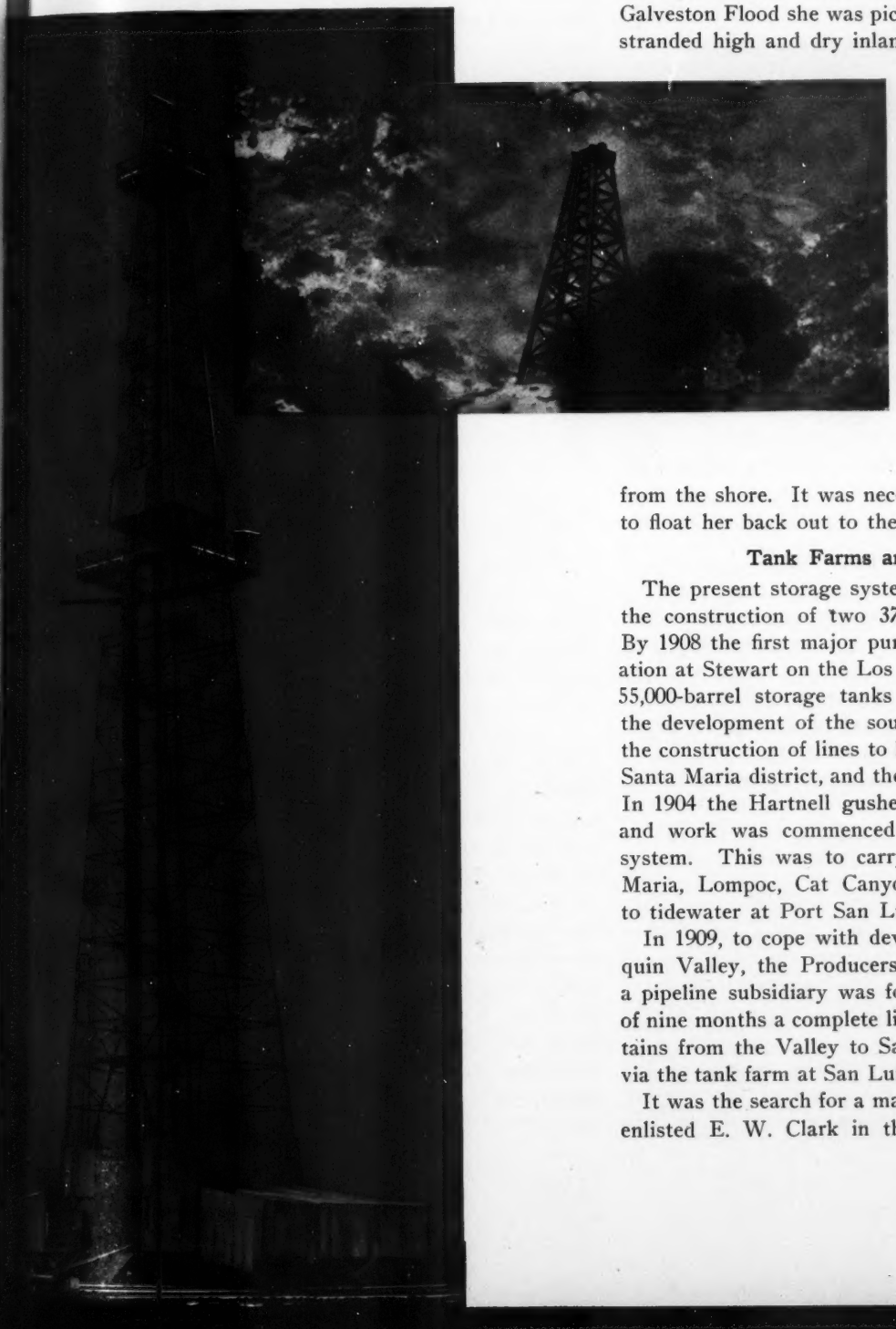


cisco area, and the growth of coastwise shipping through the Golden Gate indicated that the logical location for the company's next refinery was somewhere in the vicinity of the Bay City. Accordingly,

a site was purchased at Oleum and construction of the new plant was begun in 1895. Some of the equipment at Santa Paula was dismantled and shipped north at this time. Just a year later the whole Santa Paula unit was gutted by fire. (It was not rebuilt until 1911.)

The Oleum refinery from the outset was devoted to the manufacture of a wide diversity of products, including lubricating oils, greases, and other packaged commodities, and to this day is regarded as one of the most modern plants of its type on the Pacific Coast.

Two small marketing stations, one in Ventura and one in San Pedro, were still sufficient, however, to care for domestic distribution.



Type of equipment used by the Company in present-day deep drilling operations.
Inset: The first well drilled by Hardison & Stewart in Pico Canyon, 1883.

Marine Expansion

Union Oil Company's marine department was begun in 1900 with the construction of the **Santa Paula,** a full-rigged schooner, carrying about 8000 barrels of oil. In 1902 the barkentine **Fullerton,** of 16,000-barrel capacity, was added. Then in 1903 came the company's first steam tanker, the **Whittier.** This vessel achieved fame in its first year of operation by towing the **Santa Paula** and **Fullerton** to Honolulu, thus commencing Union Oil Company's business in the Islands with a unique demonstration. Several other vessels were added to the fleet before 1910, notably the **Washentaw, Roma, Lansing, Argyle, Santa Rita** and **Santa Maria.** The **Roma** was involved in a very unusual incident some years later that is worth recounting. During the Galveston Flood she was picked up by a tidal wave and stranded high and dry inland about a mile and a half from the shore. It was necessary to dredge a channel to float her back out to the ocean again.

Tank Farms and Pipe Lines

The present storage system was begun in 1902 with the construction of two 37,000-barrel tanks at Brea. By 1908 the first major pumping station was in operation at Stewart on the Los Angeles Pipeline with two 55,000-barrel storage tanks added. Concurrent with the development of the southern pipeline system was the construction of lines to handle production from the Santa Maria district, and the San Joaquin Valley fields. In 1904 the Hartnell gusher came in at Santa Maria, and work was commenced on the Lompoc Pipeline system. This was to carry oil from wells in Santa Maria, Lompoc, Cat Canyon and Casmalia oil fields to tidewater at Port San Luis, some 33 miles away.

In 1909, to cope with developments in the San Joaquin Valley, the Producers Transportation Company, a pipeline subsidiary was formed. In the short space of nine months a complete line was laid over the mountains from the Valley to Santa Margarita, and thence via the tank farm at San Luis Obispo to Port San Luis.

It was the search for a manager for this pipeline that enlisted E. W. Clark in the Union Oil family. He

was one of the organizers of the Pinal Dome Company, and had been long identified with the Pacific Coast Railway. These connections brought him into frequent contact with Lyman Stewart, W. L. Stewart, and W. W. Orcutt, all of whom admired his friendly attitude and business ability. He was offered the position, accepted it, and for 20 years served Union Oil Company faithfully and capably. For 15 years he occupied the important position of executive vice-president. "'E. W.", as he was commonly known, was a man of fine balance, and was deeply respected by all who knew him. He loved to wander around the fields and pop into the out-of-the-way places for a chat with the operators. Every man in the field and pipeline knew him and admired him, and his judgment was

just as eagerly sought by the man on the job, as it was by the executive officers of the company.

Other outstanding men of the industry, who became affiliated with Union Oil Company in this era were R. J. Keown, whose record of useful service extended for 24 years. He was treasurer for 13 years, was a member of the board of directors, and was elected vice-president in 1927. Closely identified with him was J. M. Rust, who succeeded him as treasurer in 1931, and had been 34 years with the company, when he retired in 1940. John McPeak, also came into the organization just after the turn of the century as cashier, and later held the office of secretary for 18 years. He died suddenly on June 20, 1934, after 27 years of noteworthy contribution to the company and to the industry.

Refinery Expansion

The expansion of refinery facilities began in 1902 when a small plant was erected at Maltha, near Bakersfield. Originally constructed for the manufacture of asphalt, it was later converted to the production of refined oils. A third refinery was installed on the shore of San Luis Obispo Bay at the little town of Avila in 1910.

Most noticeable, however, in the growth of the company at this time was the extension of marketing facilities. Bulk stations were opened in San Francisco, Portland, Stockton, Oakland, San Jose, Seattle, Phoenix, Sacramento, Fresno, and San Diego between 1904 and 1910. A station was also started in Taltal, Chile, and business dealings in the Hawaiian Islands, instituted in 1903, were developing fast.

Developments in the Drilling Art

Some important contributions to the technique of drilling were made by Frank Hill during this second decade of Union Oil Company development. His introduction of a self-dumping bailer enabled operators for the first time to cement off formation water. The apparatus was first used successfully on Hill No. 4, which had encountered water trouble at about 2000 feet. The water was completely excluded and the well brought in for a substantial yield. The value of this innovation to the oil industry needs no emphasis. The cementing process is still universally used, and has tremendously facilitated and increased the production of dry crude in oil fields all over the world.

Hartnell No. 1

About the time Frank Hill was endeavoring to establish the rationality of the cementing idea, Union Oil Company was bringing in a well in the Santa Maria area that was promoting lots of excitement in the oil world. This was Hartnell No. 1, already mentioned. Not the least excited were the operators in charge of the project. In fact, it is popularly recorded that due to some misunderstanding during the completion, the control valve remained closed when it unquestionably should have been open. The result was that the mounting pressure finally found relief through sundry subterranean channels, and dissipated itself in a spectacular display of miniature oil geysers, from rabbit burrows, squirrel holes, and other opportune openings. For a radius of several hundred feet around the well these tiny fountains squirted indiscriminately, until the reason was found, and matters were adjusted. Hartnell No. 1 for some time thereafter produced more than 10,000 barrels a day, and was rated the country's largest producer, until deposed by the Lakeview gusher in 1910.

The Lakeview Gusher

The latter, incidentally, was spudded in in January, 1909. Located about a mile north of Maricopa on wildcat land leased by the Lakeview Oil Company, it had in its early stages all the earmarks of a white elephant. The hole was costly. Tools were lost one after another, and hopes of success had almost completely faded when Union Oil Company purchased a half interest in the venture. Walter Barnhardt, later drilling superintendent for the Company, was placed in charge, and Charlie "Dusty" Woods was foreman. Then on March 15, 1910, Lakeview No. 1 came in with a vengeance. Completely out of control, the roaring stream could be heard for miles, as it shot skyward to the tune of approximately 80,000 barrels a day. Sumps

were built as hastily as possible with the aid of sandbags, and in order to catch the overflow a crudely walled reservoir, 16 acres in extent, was constructed. It was fortunate, too, that this precaution had been taken for an earthquake later leveled the walls of the sumps.

Canyons in the nearby Hovey Hills were dammed to prevent flood waters carrying off the precious black fluid. A 4½-inch pipeline, two and a half miles long, was laid from the sump holes to the Union Oil Company storage tanks in a few hours. All available help was requisitioned in a frantic endeavor to salvage the wild flow.

Recovering 6,000,000 Barrels of Oil

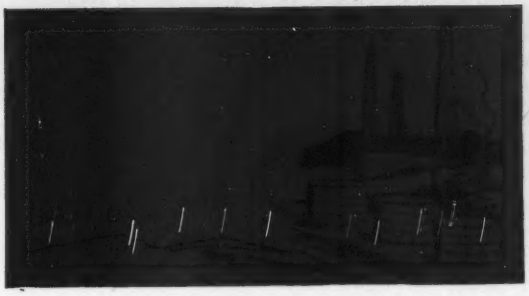
For eighteen months the well continued to disgorge its hoarded wealth. Experts estimated that 9,000,000 barrels had been spilled out. Practically 6,000,000 were recovered—enough to drop the price of crude from 50 cents to 30 cents a barrel. On September 4, 1911, as suddenly as it came in, the Lakeview gusher ceased to flow, and one of the greatest episodes in

California petroleum history began to fade into the obscurity of time.

Gasoline Era Begins

Between 1900 and 1910 some interesting changes were also taking place in the distributing and marketing systems. The salesman's buggy, and the horse-drawn tank wagon began to disappear about the end of the decade, and their places were being taken by the automobile and the motor truck. Gasoline was gradually climbing to an important place in the sales scheme, and kerosene was co-incidentally being nosed out of the lead.

Santa Maria, Coalinga, Kern River, Midway and McKittrick were adding new production to bring Union Oil Company's annual total up to approximately 5,000,000. In fact, the business of the company was expanding so rapidly that in 1908 the net value of properties was so far in excess of the capital stock issued that authorized capital was increased to $50,000,000.



Santa Fe Springs

The third decade was marked by the same healthy growth. Among the outstanding developments in drilling and production were the bringing in of the Lakeview gusher, already described; the opening of the Richfield district in Orange County, and the discovery of the Santa Fe Springs field. The discovery well, Meyer No. 3, was not a very prolific producer, and its completion in 1919 created little excitement. Two years later, however, Bell No. 1 came in for about 4500 barrels a day of the highest gravity oil so far tapped in such quantities in California. This was the well that started the Santa Fe Springs boom, and developed the territory into one of the most spectacular fields in California.

To the tanker fleet had been added the **Oleum, Erskine M. Phelps, Lyman Stewart, Los Angeles, La Brea, Montebello, Santa Maria, La Placentia,** and **La Purisima.**

Storage capacity on the Los Angeles pipeline had risen to 1,360,000 and it was handling 500,000 barrels a month.

Wilmington Refinery

Brea refinery was completed in 1911 and in 1917 construction was begun on the company's largest refinery at Wilmington on the inner harbor of Los Angeles. Union Oil Company was the first to see the future value of the Los Angeles Harbor as an oil port, and its refinery was the first to be constructed there.

The growth of the marketing system in this period may be seen in the opening of sales stations in Vancouver, Canada, Balboa in the Canal Zone, and El Centro on the Mexican border.

W. L. Stewart Becomes President

In 1914 Lyman Stewart resigned the presidency, leaving to the stockholders of the Union Oil Company a fine testament to his 20 years of able guidance. He was succeeded by his son, William Lyman Stewart, who had come to California with him in 1883, and had been intimately concerned with the affairs of the company since that time. Lyman Stewart, following his resignation from the presidency, was elected chairman

of the Board of Directors, a position he retained until taken by death in 1923. Of him one writer said, "Long will we remember him—a mighty builder in a mighty industry—a power for good in a wanting world —a man."

W. L. Stewart was only 15 when brought to California by his father in 1883. He attended high school at Santa Barbara, and received his academic training at University of California. During school vacations he worked with pick and shovel in the oil fields, and early became conversant with the operations of the oil workers. He was elected a member of the Board of Directors of Union Oil Company in 1892 and two years later was appointed treasurer. He also held the office of secretary for three years, and was elevated to the vice-presidency in 1903.

Keen Interest in Employees

To W. L. Stewart may be attributed the beginning of a systematic industrial relations activity. He had an intense interest in the problems of the employees. Men instinctively liked him, and he showed the same capacity as his father to enlist in the company's service capable, experienced workmen in all phases of the industry. He was quick to approve worthwhile effort, and believed in giving his lieutenants scope to apply their talents. If he were alive today there is no question that W. L. Stewart would be a proponent of decentralization. About his own duties he went quietly and unobtrusively, preferring always to encourage and direct rather than to drive. He was amenable to suggestion at all times. Democratic, soft-spoken, and kindly, he was nevertheless a man of decision, and Union Oil Company enjoyed a remarkable period of progress and prosperity under his leadership.

In the same year that witnessed W. L. Stewart's elevation to the presidency, R. D. Matthews joined the company as comptroller. Born near Cardiff, Wales, he came to the United States at the age of 25, and immediately became associated with Price, Waterhouse & Co. Two years later he joined the staff of Union and was shortly thereafter elected to the executive committee of the Board of Directors. He became executive vice-president in 1931.

R. D. Matthews

As comptroller, R. D. Matthews is credited with the installation of an accounting system that is still largely followed. One of his major contributions was the Employee's Provident Fund, which was instituted under his direction in 1923, and was conceded by financial experts generally to be the finest thing of its kind so far developed. The passing of the Federal Social Security Act, and other social reforms accomplished later, resulted in the closing of the Fund, and the substitution of an alternate retirement plan in 1939. For 16 years, however, the Provident Fund had served largely to give to Union Oil Company employees that sense of future security which seems to be so necessary to productive effort.

R. D. Matthews retired in 1939, having been with the company for 26 years, during which he discharged, in addition to the important assignments mentioned, the duties of vice-president in charge of manufacturing,

and vice-president in charge of domestic and export sales.

L. P. St. Clair

Toward the end of the decade, 1919 to be exact, L. P. St. Clair, who had long been a prominent figure in the industry, became associated with Union Oil Company. Born at Dutch Flat in Placer County, California, he garnered his first oil experience in Bakersfield, whence his folks had moved when he was 16 years of age. After a diversified experience in local business affairs, St. Clair began to acquire oil holdings, and finally had acquired so much that he found it necessary to devote all of his time to petroleum.

Independent Oil Producers Agency

When about 1905 low prices threatened to ruin the producers of the San Joaquin Valley, L. P. St. Clair was active in the organization of the Independent Oil Producers Agency. This was a cooperative association designed to prevent exploitation at the expense of the small producer. He was elected president of the organization in 1909, and so capably conducted its affairs that he has remained president until the present time. The agency, under L. P. St. Clair's direction, succeeded in inducing Union Oil Company to build a pipeline from the Valley fields to the coast, transport their oil to seaboard, and act as selling agent. This, of course, brought L. P. St. Clair and Union officials together, and gave the latter an opportunity to observe the ability of the Agency president. The result was that in 1919 he was elected to the Board of Directors of Union Oil Company.

Period of Scientific Development

The decade from 1920 to 1930 may be characterized as the period of scientific development. Every phase

of the industry seemed to be making rapid strides technically. Ten years of experience with rotary equipment was greatly speeding drilling operations, and increasing the effective depth of producing wells.

The Gardena Syndicate Well No. 1 drilled by Union in 1924 and bottomed at 7319 feet was the deepest well of its time. Meantime further new and prolific fields were being discovered, and exploited. Most notable discoveries were the Dominguez and Rosecrans fields, yielding a refining crude of exceptionally high gasoline content. Other fields in which Union became active about this time were Huntington Beach, Long Beach, and Torrance. During the latter part of 1928, new deep producing zones were discovered at Santa Fe Springs, and the industry was faced by a serious over-production problem. A voluntarily instituted curtailment program for the moment at least saved the situation. In this L. P. St. Clair played a prominent part, and acquired national recognition as an authority on oil conservation.

In 1922 and 1923 four vessels, the **Cathwood, Utacarbon, Deroche** and **Warwick** were purchased from the United States Shipping Board, and the **Lyman Stewart** met with disaster off the Golden Gate, one of a series of remarkable coincidences that will be recounted in a later chapter. Before the end of this ten-year period, the **Unacana** had been purchased to ply the Canadian and Alaskan water routes, and several other small craft had been added to the marine facilities. In 1923, William Groundwater became manager of transportation, in which capacity he assumed charge of the company's fleet.

Research

Signalling the beginning of the organized scientific era a fully modern research laboratory was completed at Wilmington in 1923, and under the able direction of R. E. Haylett, a group of young chemists and engineers were beginning to study automobile engines with particular respect to their fuel and lubrication requirements. Early in the decade the company was already advertising the non-detonating quality of its gasoline. The public was becoming knock conscious, and automotive engineers were experimenting with higher compression engines. Union began pioneering Ethyl gasoline on the Pacific Coast in 1927.

W. L. Stewart, Jr., was initiated into the oil business permanently in 1923. (Like his father he had roustied in the field, gas and other operating departments during school vacations.) Discontinuing his studies at Stanford to enter the flying service in 1918, he received his

discharge in 1919, and proceeded to Massachusetts Institute of Technology, whence he graduated in 1923. He was elected to the Board of Directors in 1926; was placed in charge of the manufacturing departments in 1929, and one year later was appointed vice-president.

At the beginning of this same decade, Paul M. Gregg withdrew from the firm of Andrews, Toland, Gregg and Andrews, to become counsel for Union Oil Company. Born at Independence, Inyo County, he was the son of a prominent attorney and Judge of the Supreme Court, was a member of the first graduating class of Stanford, and, of course, numbered among his classmates Herbert H. Hoover and W. W. Orcutt. The company's interests in Santa Maria, and the legal aspects of pipeline construction provided Paul Gregg's first contacts. He was counsel for Pinal Dome Oil Company, which was absorbed by Union in 1917. It was not until 1921, however, that he began devoting his entire time as counsel to the affairs of the company. He was elected to the vice-presidency in 1931.

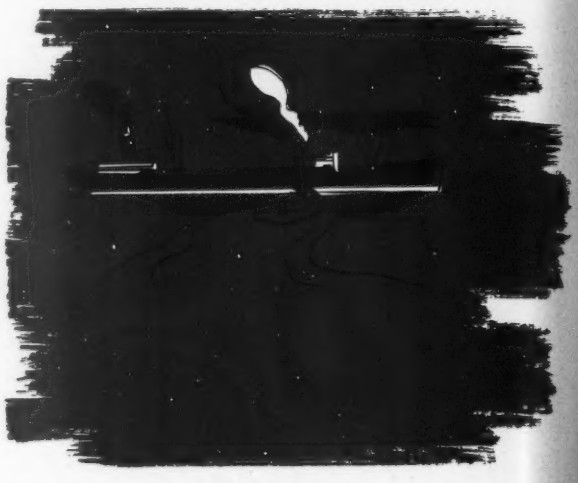
Fight For Control

Several attempts were made in the early days by various organizations to secure control of Union Oil Company and its holdings, but in every case they were thwarted by the watchfulness and business acumen of the ruling executives. One such attempt was made in 1919 when a group of Eastern financiers came to the Pacific Coast with the idea of entering the Western petroleum industry. Union Oil Company with its substantial holdings, low capitalization and lucrative business, seemed to be a very attractive plum. Finding that the company wasn't for sale, they began quietly buying stock in the open market, and by this means had acquired a 25 percent interest. Their activities ran the stock up to $160 a share. With this interest and some other California investments they launched a holding company. That was as far as they got, however, and the effort eventually proved futile. In order to forestall any future scheme of this kind, and to prevent control of Union Oil Company falling into other hands, Union Oil Associates was incorporated in 1922. Stockholders of Union Oil Company simply exchanged their holdings, share for share for those of Associates. In this manner the latter finally exercised control of 56 percent of the outstandng stock, and the danger of acquisition by outsiders was averted. When there seemed to be no longer any need for such an organization, Union Oil Associates was disincorporated.

Further emphasizing the progress of the scientific era, nuero-paleontology became in this decade a powerful aid to geology in exploratory work. The discoveries of Dominguez and Rosecrans fields, combined with more efficient methods of production, lofted the yield of crude oil in 1930 to 17,000,000 barrels. By this time the industry was becoming vastly concerned over the problem of curtailment.

A. C. Rubel

A. C. Rubel had just become chief petroleum engineer, and was already attracting wide attention because of his evident understanding of men and oil wells. Alert, democratic, and thoroughly capable, he is one of the youngest and most popular executives in the oil business. To this day, despite the recognition he has received—he is now vice-president in charge of production, and a member of the executive committee —he remains "Cy" to everyone with whom he came in contact on the way up. An indefatigable worker, and a keen thinker, "Cy" is regarded by the industry nationally as a real authority on every phase of field operation, from oil finding to oil producing.



In this same decade pipeline storage capacity jumped to 28,000,000 barrels. Cracking facilities were added at the Los Angeles refinery. Eight absorption plants with a treating capacity of approximately 133,000,000 cubic feet of gas per day were built between 1920 and 1926.

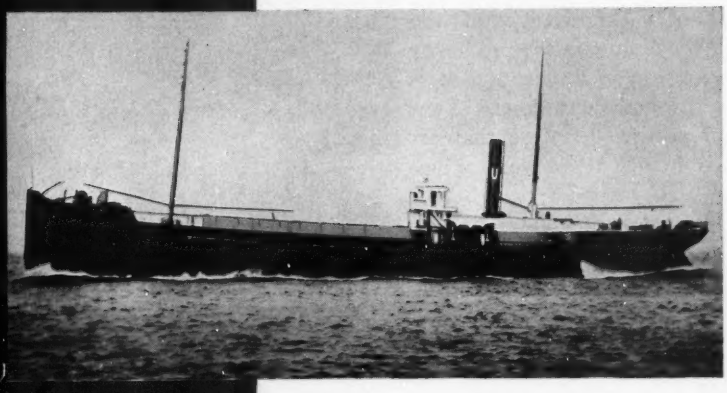
This period of development also saw the completion of a marketing station in Honolulu; the opening of a district office in Spokane, Washington. Total sales of all commodities in 1929 reached $88,864,519. Five years earlier authorized capital stock had been increased to $125,000,000.

Passing of W. L. Stewart

In June 1930 death closed the career of William Lyman Stewart, after thirty-six years of outstanding

contribution to Union Oil Company. He had been an executive officer of the company since 1894, and had contributed largely to its progress through all the years of his association. A humanitarian always, W. L. Stewart earned the genuine friendship of the employees of the company, and of the members of the industry. Like most oil men he loved a good story and had a keen sense of humor. He was a strong factor in the building of Union Oil Company into a sound, enduring, reliable institution, and his contributions to the social and economic advancement of the Pacific Coast States unquestionably entitle him to a place among the outstanding business men of the West.

Elected to succeed W. L. Stewart was L. P. St. Clair, executive vice-president, who had become well known to the industry through his vigorous championing of oil and gas conservation measures. At the time of his election to the chief executive office of the company, Mr. St. Clair was vice-president of the American Petroleum Institute, and president of the Independent Oil Producers Agency. With a wealth of experience in the industry he became a virile, dominant figure in western petroleum circles. Of the preservation of oil resources for future generations he was an unyielding proponent. To him must be given the credit for steering Union Oil Company safely



Added to the Company's tanker fleet in 1939 was the L. P. St. Clair, of 102,000-barrel capacity.

Inset: The Whittier, Union Oil Company's first steam tanker, built in 1903.

through one of the most disastrous depressions in economic history, with no loss of stability.

Following a serious accident in 1938, which kept him away from active participation in the affairs of the company for several months, he resigned the presidency, and was elected chairman of the Board of Directors. That, too, he relinquished later in order to conserve his health, and he now finds ample occupation in the conduct of the Independent Oil Producers Agency of which he is still president.

Entering the last decade of Union Oil Company history, we find economic unrest, and highly competitive conditions exercising very marked influence on the methods and processes employed in every phase of activity. All industry has been affected by changing ideas of social responsibility and social relationships. The machine age is accelerating. Science is examining more critically than ever before the fundamental requirements of industry, and the constitutional properties of crude oil — the petroleum workers' raw product.

Geophysics

Geology, paleontology, and the latest exploration aid —geophysics, are working hand in hand, correlating their respective findings and eliminating much of the

gamble from oil prospecting. A corps of Union Oil Company engineers and chemists are stealing subsurface secrets from core samples taken thousands of feet down—and brought to the top exactly as they existed below. Gadgets and devices probe the depths, determining pressures here and pressures there—temperatures here and temperatures there. With actual samples of the producing formations, and the products emanating from these, plus a knowledge of the physical conditions that influence flow in the producing zone the engineer is in a position to duplicate closely in his laboratory the underground conditions. Thus are determined all sorts of pertinent factors that are essential to the systematic and efficient recovery of natural gas and crude oil.

Faster and Deeper Drilling

Faster and deeper drilling has not only resulted in the discovery of new fields—notably Santa Maria Valley, and Rio Bravo—with greatly increased production, but has brought new life to dwindling territories such as Santa Fe Springs, Montebello, Dominguez, etc. In the development of more effective drilling methods, Union has played a leading part.

Crooked holes can be drilled by either cable or rotary drilling, but it is probable that an uncontrolled rotary bit will wander much more wildly astray than a cable tool. In any case it was not until after the beginning of deep hole rotary drilling that the significance of the crooked hole became obvious. Union Oil Company field department in cooperation with independent technicians and equipment manufacturers loaned its efforts generously to the development of direction finders, surveying devices, and other instruments of the scientific drilling art. Some evidence of the efficacy of this type of equipment may be derived from the facts that Union Oil Company's Rio Bravo well, K.C.L. 1-34, was carried to 11,302 feet without at any point veering from the perpendicular more than two degrees. Some conception of the speed with which drilling may be carried on under modern conditions is found in a Union Oil Company drilling report for November 27, 1939. This records that for the 24 hours of that day the drillers penetrated to a depth of 1706 feet in Kernco well 52-34—practically 71 feet an hour. Contrast that with Colonel Drake's famous achievement. It took the redoubtable Colonel six months to drill 69½ feet—and this is not by any means casting aspersions on a worthy effort. Rather it is to show the progress that has been made in the meantime.

Changes In Equipment

To drill deep holes it has been necessary to adapt, modify, and in many cases completely alter existing equipment. The tremendous strings of drill pipe and casing that have to be handled require correspondingly powerful machinery, and the problem has been to acquire the power without adding too much to the weight, or to the hazard of operation. High pressures exert tremendous strains. Heavy casings and fittings are necessary to cope with deep well pressures. In all of this adaptation to changing technique, Union Oil Company field department has played a prominent part. In the actual utilization of new equipment and modernized devices, Union drilling projects have been the laboratories of inventors for many years.

Continuous core samplers, directional finders, perforation guns, formation testers, and all the scientifically sound innovations of the modern equipment manufacturer have found an encouraging reception among the progressive operators of this progressive organization.

In the past decade the geological group has been responsible for some of the most important discoveries in the west. In four years, despite the production of some 60,000,000 barrels of crude oil, Union's exploration agencies have added to the reserve of the company 40,000,000 barrels.

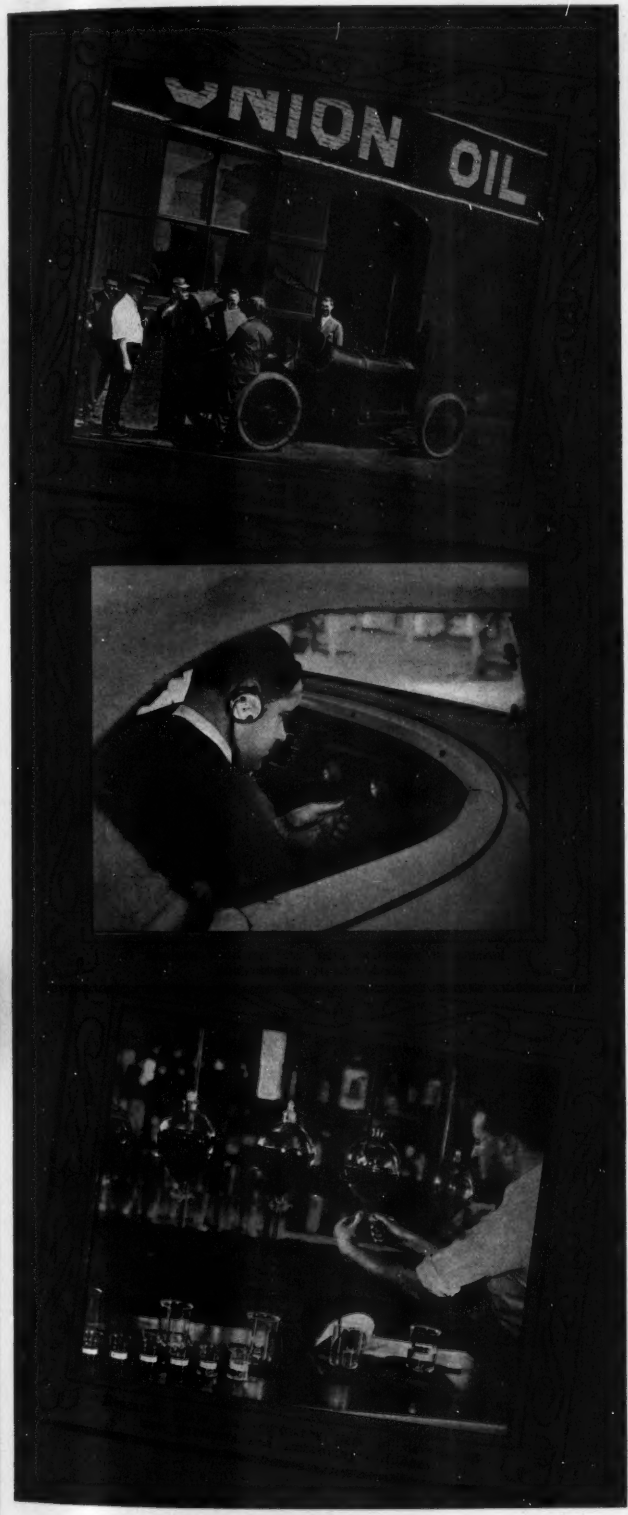
During 1939 the drilling department completed 59 new wells, which with redrilling and reconditioning, brought the total number of projects for the year to 73, and the company's total to 1221 wells. Actual footage drilled during the year was 517,421.

Including royalty oil, co-owners' shares, etc., the total quantity of oil produced from properties operated by the company in 1939 was 17,973,336 barrels. Potential production added during the year was approxi-

mately 83,299 barrels per day, bringing the total daily potential up to 205,523 barrels.

Pipeline Progress

Pipeline progress in the last decade was signalized by the construction in 1930 of an eighty mile 6-inch line between Tar Canyon pumping station (adjacent to Kettleman Hills) and Avila refinery on the coast near Port San Luis. This line at the time it was built was the only line from Kettleman to the Coast handling natural gasoline. With its completion the trunk and gathering lines of the company now exceed 1000 miles. They transport oil from most of the important fields in California to refineries or marine terminals. It is estimated that since the beginning of operations approximately a billion barrels of oil have been conveyed through Union Oil Company pipelines. The daily capacity of all lines is about 170,000 barrels, and storage capacity is 27,000,000 barrels.



Storage Problem Solved

With the invasion of the technicians, pipeline transportation and storage have also become highly scientific procedures. The problems of reducing evaporation losses to a minimum, of resolving emulsions, and ridding crude oil of bothersome water, of storing and transporting all the various types of commodities, most efficiently, of accurately measuring and testing crude and refined oils, fall definitely within the scope of the chemist and the engineer. Union Oil Company has for many years studied evaporation losses, and among the unique methods of counteracting their deleterious effects is that employed at Stewart Station on the Los Angeles pipeline. Here exhaust gases, rich in carbon dioxide, from the boilers are cooled and conducted to the vapor space in the top of light oil tankage. Carbon dioxide being both heavy and non-inflammable at once minimizes evaporation losses, and reduces the fire hazard. The same procedure is followed on many of the tankers.

Dehydration

Dehydration has been the subject of an intense investigation for many years, and Union was one of the first oil companies to contrive field resolution of water emulsions by injection of demulsifying agents directly into the wells. Electric dehydration, and centralization of equipment to accomplish the most desirable effect at the lowest cost, has also served greatly to economize pipeline operations.

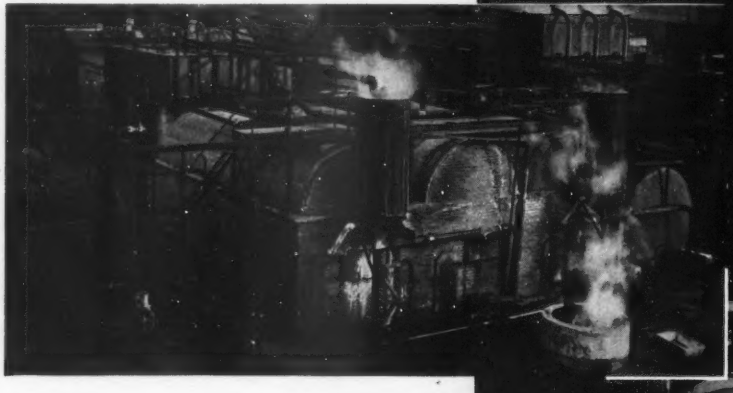
In the past ten years Union has also been active in defining the most accurate methods of measuring and testing crude oil, and many of the present testing practices of the industry were pioneered in the laboratories of the company.

In the year 1937 there occurred an event which concluded one of the most remarkable series of coincidences in marine history—the **Frank H. Buck** collided with the **SS. President Coolidge** and sank just off Mile Rock at San Francisco. That in itself doesn't stir up a great deal of excitement, but the complete story certainly has drama—lots of it. It begins in 1914—when two ships, the **Lyman Stewart** and the **Frank Buck** were launched in the Bethlehem Shipyards at the Bay City. These two vessels were sisters in every

sense of the word. They were built to exactly the same specifications, were identical in all details, and they came off the ways to ply their respective routes in the same business—petroleum transportation.

Without mishap, at least of any major consequence, they engaged unobtrusively in this trade until October 7, 1922, when the **Lyman Stewart,** owned by Union Oil Company, crashed into the **SS. Walter A. Luckenbach** off Point Lobos San Francisco, and finally piled up on the rocks just below the Cliff House at Mile Rock. The crew was safely removed but the ship was a complete loss. Thus the first of the sisters returned to her home port to perish—the Golden Gate, the very portal from which she had so proudly steamed out to sea just eight years before.

The **Frank H. Buck,** owned by the Associated Oil Company, continued serenely on her way, carrying



The vacuum distillation unit, a feature of the modern Oleum Refinery.

Inset: Oleum Refinery as it appeared in 1913, showing shell stills.

petroleum products to and from Pacific Coast ports, but occasionally venturing on more extended trips to Honolulu, South America, and the East. With little interruption her schedule was maintained until March 3, 1937. Then, without warning, she collided with the **SS. President Coolidge,** strangely enough almost at the identical spot where her sister, the **Lyman Stewart,** met disaster almost 15 years before. The crew escaped in the lifeboats without mishap, and an effort was made to tow the vessel to port. It was of no avail, however, and she finally grounded, broke amidships, and settled down within fifty feet of the **Lyman Stewart.**

And there they lie—these twin sisters. Built in the same yard in the same year, they went their diverse ways. One lasted eight years, the other 23 years. They met an exactly similar fate, fifteen years apart, in almost the identical spot—a watery burial plot in the shadow of their birth place.

In 1938 Union Oil Company began a program of tanker replacement, and the contract for the first vessel was awarded on March 15 of that year. On December 10, 1938, the **L. P. St. Clair** was launched at the Sparrows Point yard of the Bethlehem Steel Company, with Mrs. St. Clair performing the christening ceremony. Shortly thereafter the thoroughly modern craft, incorporating every conceivable device for the safety of the crew and the preservation of the cargo, arrived at Los Angeles and was immediately absorbed into the marine transportation routine. The new ship has a capacity of approximately 103,000 barrels, and can take care of any liquid petroleum cargo from gasoline to fuel oil. A second tanker of the same type—the **Victor H. Kelly**—named in honor of the vice-president in charge of sales, entered the service at the end of March, 1940, bringing the tanker fleet to a total of 13, to which may be added some 20 barges. These vessels have an approximate carrying capacity of 1,000,000 barrels. They transport crude and refined oils over western waters, from Alaska to Hawaii and Chile,

through the Canal to the East Coast, and thence to many foreign ports.

Accomplishments of Research Department

No history of Union Oil Company would be complete without some chronological record of the accomplishment of its research department, which in actuality is as old as the company itself. It is only in the past 20 years, however, that research and development have been correlated and centralized, and in the competitive decade just concluded, that it has been extended in scope, and increased to its present intensity. Its purpose now is not to advance any specific phase of company activity, but to aid in the progress of every phase. From the exploration of prospective oil lands to the marketing of products there is not a single aspect of the business in which the technicians of the research and development department do not play some interesting role.

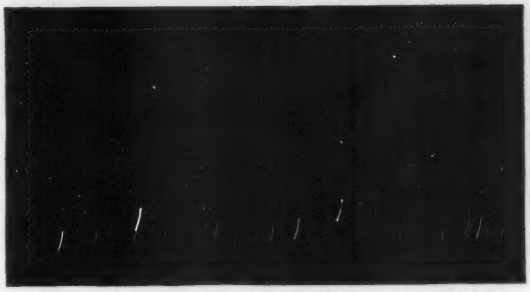
Nor is the field of endeavor limited to the confines of the company. A great diversity of petroleum products are used by industrialists all over the world for a wide variety of purposes. Each new use requires a definition of specifications, and a modification of process to meet the prevailing need. Searching for new commodities and new uses is a recognized responsibility that has furnished Union Oil Company customers with a choice of products and specialties of the highest quality.

Every fresh discovery meant the devising of new type equipment by the development engineers, and construction and operation of new plants and processes, which in turn meant jobs to western people.

There is no question that the constant application of

chemical and engineering research has been one of the prime factors in maintaining Union Oil Company as an aggressive forward looking organization. Past accomplishment, and the present position is due to the constant search for newer, more efficient methods, and better and still better quality products.

The synthesis of gasolines and other organic com-



pounds is the prevailing interest of petroleum research workers, and Union Oil Company's staff is no exception. First visualizing the needs of the future, the modern chemist now conducts researches leading to the transmutation of the old into the new. Petroleum hydrocarbons are being torn down into their simplest constituents and reassembled; hitherto unremovable substances are being removed from existing compounds; hitherto unbreakable substances are being broken down. And out of this search are coming the fuels and the lubricants of tomorrow. Out of it have already come such processes as catalytic polymerization, alkylation and other refining methods of turning waste products into useful commodities of high quality.

From the laboratory equipment devised by these experiments have been adapted the huge refinery units for the manufacture of synthesized compounds on a commercial scale. Union Oil Company's refinery equipment undergoes a constant re-shaping and rebuilding in order to keep not only abreast but ahead of the industrial requirement. During the past decade substantial additions and alterations have been made in the refineries. A propane solvent refinery plant, with all its incidental units and appurtenances, and a phenol solvent refining plant to meet the increased demand for solvent treated motor oils, have been added at Oleum.

An alkylation unit is now in the process of construction at Los Angeles. In addition there is contemplated the erection of a coking unit, a hydroformer and a polymerization plant this year.

Three California Refineries

Union Oil Company now has in operation three refineries, all located in California, with a total effective daily crude oil throughput capacity of 96,000 barrels. Cracking plants have a total productive capacity of 7,400 barrels daily of cracked gasoline. Crude oil processed at refineries totaled 25,773,000 barrels during 1939.

Carbocyclic Compounds

An interesting feature of the refining routine at Los Angeles plant is the manufacture by a modified Edeleanu Process of aromatic solvents. These were formerly only obtainable from coal tar, but the petroleum derivatives are now much in demand. They are employed extensively as thinners for automobile body paints and lacquers, which it is estimated are being

used on more than 75 per cent of the new cars that are sold today.

less co-owners' interests but subject to royalty amounted to 1,529,000 barrels.

Natural gas and gasoline are becoming more important to the refiner with every scientific step forward. With the commercial adaptation of polymerization to the manufacture of high octane gasolines, constituents of natural gas, formerly of little consequence, have now become valuable raw products. In any program of synthesis involving petroleum products, natural gas and gasoline are bound to be important future source materials. Hence, Union Oil Company looking to the future has striven to keep well in the forefront of technical advance in the natural gas and gasoline industry.

This attractive, modern station is designed for speedy and effective service.
Inset: The Company's first service station, built at Los Angeles in 1913.

No doubt much of future operation will be centered around the manufacture of similar compounds, since it has been found that gases produced during cracking are rich in the olefins from which such compounds are made. Industrial organic chemicals already produced from this source include ethyl alcohol, isopropyl alcohol, acetone, glycol, ethylene glycol, diethylene glycol, and many other important ethers, keytones, esters, amines, etc. Glycerine, the raw material of many explosives, can also be obtained from cracked petroleum gases, which undoubtedly will provide much of our war chemicals in the future.

With automotive and mechanical development progressing rapidly, Union Oil Company is preparing to furnish the highly specialized fuels and lubricants that are sure to be the future demand. All of this means new processes and new equipment, and the company's refineries are constantly being modified and expanded to fill every modern need.

Natural Gasoline Plants

At the end of 1939, Union had in operation eight natural gasoline plants with a total combined throughput of 157,000,000 cubic feet of gas a day, and an effective recovery of 258,000 gallons of natural gasoline. For the year, the total production of natural gasoline,

Kelly Heads Marketing

During the last ten years the marketing facilities of the company have continued to expand under the capable direction of Victor H. Kelly, vice-president, and A. C. Stewart, assistant vice-president.

Mr. Kelly, with a lifetime of experience in the business of selling, has thoroughly established himself in the industry as a propounder of sales policy, and a keen analyst of marketing conditions and situations. He began his career as a salesman for the company at Tacoma, Washington, in 1913; was appointed chairman of the sales committee in 1929, and since then has steadily climbed to the highest sales post in the organization. (The second tanker in the replacement program, just recently added to the fleet was named the **Victor H. Kelly** in his honor.)

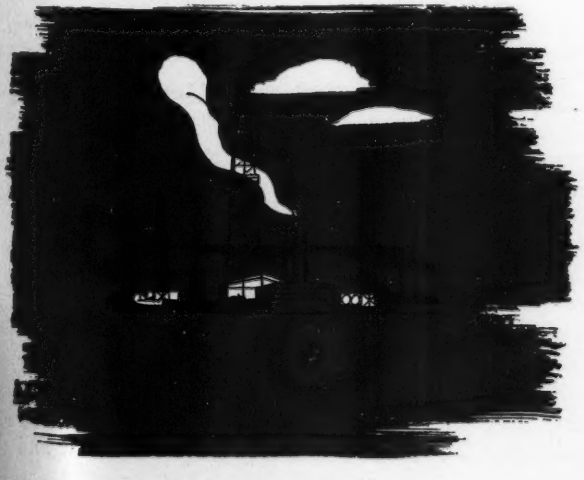
A. C. "Art" Stewart is the young, strong, active type, with the traditional Stewart good judgment and business acumen. He is a graduate of Stanford University in mechanical engineering, and Harvard University in business administration, and with V. H. Kelly as mentor is quickly becoming one of the leading sales executives on the coast.

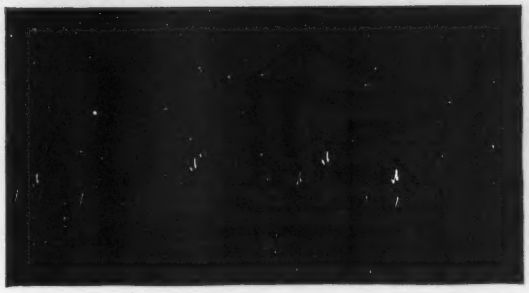
Five Divisions in Domestic Territory

Union Oil Company's domestic territory stretches from Mexico to Canada, and includes in the northern division, Washington, Oregon, and a portion of Idaho; in the central division, northern California and the greater part of Nevada; and in the southern division, southern California, the southern tip of Nevada, and Arizona. There are five division offices, and some thirty-five district offices in the United States and Canada.

Through the Union Oil Company of Canada, products are marketed in British Columbia, and the western part of Alberta, as far north as Edmonton.

Wholesale bulk stations are maintained in Alaska, Hawaii, Panama and Chile, and the company ships petroleum and its products to purchasers on the Atlantic seaboard, South and Central America, and the Orient.





The whole system of distribution, domestic, territorial, and foreign, combines the most modern facilities with ethical and effective methods of salesmanship. It is supported by a well planned advertising program, and sales promotion and merchandising aid for all field personnel and dealers.

1939 Sales Total $75,101,072

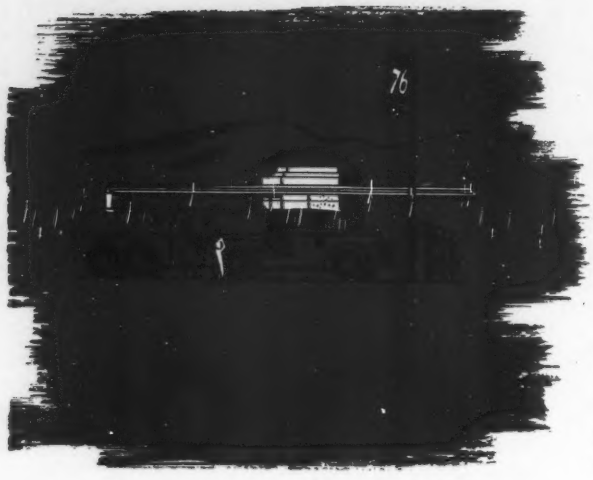
In 1939 sales of crude and refined products, exclusive of motor fuel and other sales and excise taxes, amounted to 32,276,000 barrels, and $75,101,072.

Showing the prevailing trend, five new wholesale distributing stations and 126 service stations were constructed or acquired by lease during the same period. At the end of the year there were in operation 496 domestic and foreign bulk sales stations, and 5500 retail outlets.

The Passing Years

Time has exacted a heavy toll among the pioneers in the past decade. Many have stepped aside to enjoy a little relaxation after strenuous years. Fate, however, denied this privilege to at least one. In 1934 John McPeak died very suddenly. He had served Union Oil Company for 27 years, and for 16 of them had held the important post of secretary. Born in Ireland, he never lost his native wit, and a kindly disposition and pleasing personality brought him many friends. He was succeeded in office by W. R. Edwards, who has been a member of the secretarial staff for 25 years.

L. P. St. Clair resigned the presidency in the fall of 1938, and Reese H. Taylor was elected on October 24 of that year to the chief executive post. Among the pioneers to lay down their tools were W. W. Orcutt, F. F. Hill, George H. Forster, and J. M. Rust. Elected comptroller was white-haired, distinguished looking M. G. Kerr, a popular man with his fellow employees. Friendly, easy to approach, completely human, and with about 30 years of company experience in all phases of accounting behind him, he is well fitted for his assignment. The office of treasurer was awarded to H. W. Sanders, younger looking than M. G. Kerr, but with the same pleasing disposition, and a keen mind for money matters. He knows stocks, bonds, debentures, and all the instruments of the high financier's art inside and out, and despite an innate modesty is



some day going to attract a lot of favorable attention among the economists.

R. D. Matthews, officer and director of the company for the past 25 years also tendered his resignation in 1939.

27,000 Stockholders

Stockholders of Union Oil Company number approximately 27,000. Approximately 80% of these live in the Pacific Coast area. The average holding is 170 shares, and 21,038 stockholders own 100 shares or less.

Cash dividends paid out in 49 years have amounted to $154,129,315, which was supplemented by stock dividends at par to the value of $65,073,666, a total of $219,202,981. Since the organization of the company, dividends have been paid in every year excepting 1914 and 1915.

More Than 9,000 Employees

The employees of the company now total in excess of 9000, of whom 55% have been in service for five years or more. There has been much fluctuation in numbers due to economic disturbances, such as boom drilling periods, and productive depressions, but the curve has climbed steadily nevertheless. (The number of employees in 1920 was 5469.)

More important than numbers, however, to the success of Union Oil Company are morale, internal and public relationships. With A. C. Galbraith, one of the leading industrial relationists of the United States, in charge of personnel problems, Union Oil Company's employee morale is of the highest order. Mr. Galbraith, who has been associated with the organization since 1916, has been a profound student of human relations for many years, and is known nationally for his intimate knowledge of and inspirational speeches on all phases of the subject. In addition to being vice-president of Union Oil Company, he is on the executive board of the National Association of Manufacturers, and is chairman of the Oil Exhibitors for the 1940 Golden Gate Exposition.

No means has been overlooked through the years to establish between management and employee the understanding and mutual respect that are so essential to effective effort, and satisfactory progress. Through policy booklets, employee magazines, publicity releases, vocational training classes, and other informative mediums, employees are helped to be more useful to the organization, and hence more helpful to themselves. Every effort is made to streamline operations as far as possible so that there may be no peaks and valleys of employment.

There has been instituted for the protection of employees a well-rounded program of pensions, sick benefits, and insurance. Non-contributory and contributory group insurance are protection in the event of permanent disability or death. An employee's benefit plan insures medical care and hospitalization during illness. A group disability benefit insurance plan provides income during protracted illness, and a sick pay plan assures income during the waiting period. A contributory retirement plan enables the employee with the help of the company to build up a retirement annuity. A termination allowance obviates the possibility of an employee, who is laid off through no fault of his own, being stranded without funds while he seeks re-employment, all of which relieves the employees of much of the worry that commonly springs from fear of the future, and correspondingly improves work output.

Safety First

Every precaution is taken to eliminate any influence that is likely to interfere with the effort of the worker. Conditions on the job are the subject of constant consideration and revision. Safety is a religion with Union as with all oil companies, and an unrelenting war is waged against hazard. The effect is measurable in the elevation of employee morale, and the improved quality and quantity of employee accomplishment.

In the maintenance of adequate understanding and sympathetic relationships, Union Oil Company's scheme of things by no means omits that most important body—the public. Down through the years the firm has become definitely identified with the industrial growth of the west.

Reese H. Taylor, President

Relinquishing the presidency of Consolidated Steel Corporation, Ltd., to take over the executive reins of Union Oil Company, Reese H. Taylor, a graduate of Cornell and University of California, quickly proved admirably equipped to lead the company forward into another decade of accomplishment and progress. He has the backing of a well balanced executive group, including such aggressive modernists as W. L. Stewart, Jr., and A. C. Rubel, and such experienced counselors as P. M. Gregg and V. H. Kelly. Add also the unanimous support of 9000 employees, who are for Reese Taylor and Union Oil Company, hook, line and

sinker, and it must be agreed that the future presents a very optimistic picture.

Reese Taylor is convinced that there is always room for improvement in industrial operations, and institutional security is his fetish. "Of what use," he asks, "is employee security, if the concern by which they are employed is insecure?" His respect for the opinions of the employees they like immensely, and his office stands open invitingly at all times for anyone who works for Union Oil Company.

Results of Vision and Industry

It is a long way back to that first little organization meeting in Santa Paula on October 17, 1890—almost fifty years. Tremendous changes have taken place since that time. The whole manner of human existence has altered unbelievably. Life is immeasurably easier and more enjoyable. A thousand comforts and conveniences that now we simply couldn't do without have become ours in that fifty years. All because Lyman Stewart, Wallace Hardison, and other pioneers searched and found the hidden caches and virtues of petroleum.

Despite their meager experience and lack of specialized training, these men possessed the characteristics that assure success in any enterprise. They were primarily impelled by the vision of a great future industry performing invaluable public service. They were proponents of the doctrine of cooperative endeavor. They believed in the inevitable reward of worthy effort. Hence, they persisted doggedly in the face of almost insurmountable obstacles. They were industrial explorers, searching and trying, and searching again, and they finally set the wheels of a great new western industry in motion.

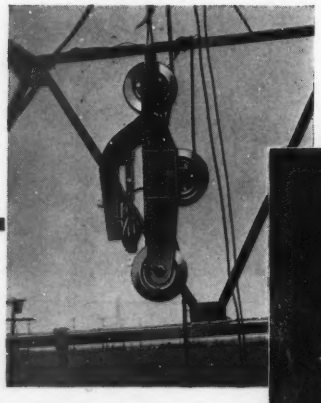
Meantime, new generations of executives and employees have taken over the conduct of affairs. Many organizations have fallen by the wayside in the meantime but Union Oil Company grows stronger daily. Science is now at the controls and great new adventures are ahead.

That small group of pioneers with nothing but indomitable courage and profound faith overcame the inertia of skepticism and ignorance, and translated a simple idea into a great and worthy organization. Some of them lived long enough to see the growth carried far beyond their expectations and no doubt found justifiable pride in their achievement.

Union Oil Company has never ceased to go forward since that time. With a competent managerial staff, 9000 employees, every modern facility, and the benefit of 50 years of experience, the way to sustained success for many years to come seems to be well assured.

Kicks

. . . sink to a new low, while efficiency and accuracy swing high, when a MacClatchie Weight Indicator is installed.



MacCLATCHIE
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With the new MacClatchie Weight Indicator it is not necessary to consult tables and make calculations. One stand of drill pipe will make the same amount of deflection on the indicator gauge whether it is the first stand in a hole or the last stand in a deep hole.

The diaphragm carriage unit is an outstanding improvement in weight indicators. There are no clamps attached to the line. The diaphragm carriage can be installed in twenty minutes Line can be spooled in either direction through frictionless carriage without adjustments or interruption Wire or write today for complete details.

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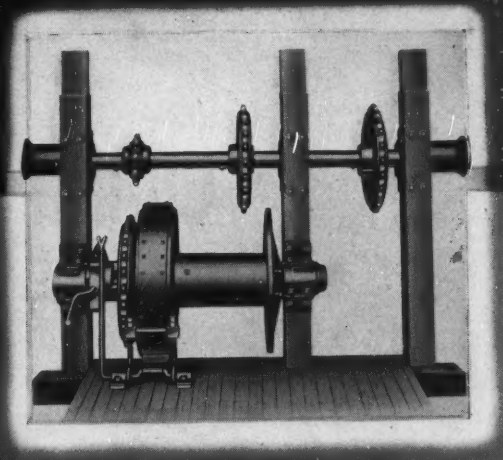
PROGRESS



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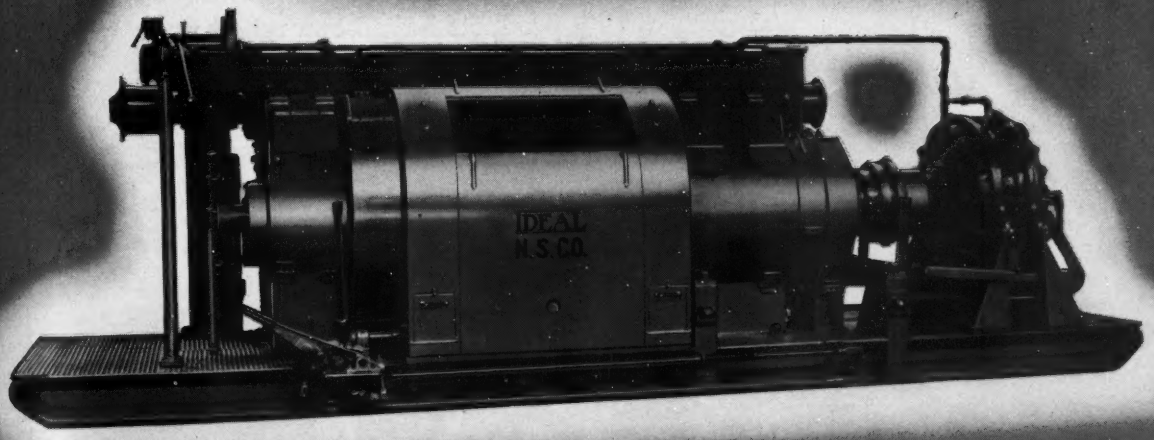
The first IDEAL Rotary Draw Works was built in the year 1910. Then the maximum depth to which a well could be drilled by the rotary system was considered to be approximately 2,000 feet.

and....

As the bit was forced to cut deeper and deeper into the earth to reach unexplored formations, IDEAL Rotary Equipment was continually strengthened and improved to keep pace with the bit and to anticipate the requirements for still greater depths.

Now...

After 30 years of development, modern IDEAL Draw Works are predominant in oil fields throughout the world and the heavier models may be used for drilling to 15,000 feet or more—obviously, they are a far cry from the comparatively crude design shown in the top illustration.



NATIONAL

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GENERAL SALES OFFICE: TOLEDO, OHIO

DIVISION OFFICES: FT. WORTH, TEXAS;
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Congratulations

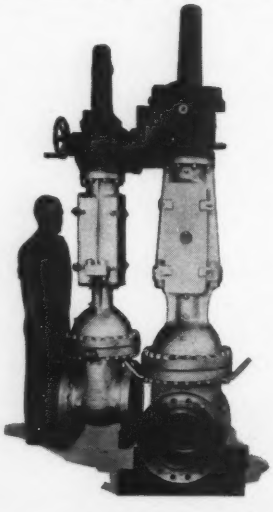
to

Union Oil Company

and its employees

Our best wishes for many more years of progress

Petroleum Equipment Company



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Ahem... The Union Oil Company's fifty years of service to the West is surely a matter of pardonable pride. We join in paying tribute. Ourselves established in the year which saw the Petroleum Industry born, we have since watched Union Oil make many notable contributions to Petroleum's progress.

Laying the first western pipe-line to tidewater . . . building the Pacific Coast's first oil tanker . . . developing products of vital importance to the public—these are among Union Oil achievements which deserve our cheers.

We are pleased with the part which Hewitt has played in Union Oil's advance. In steadfastly holding to the highest standards in our production of rubber products, we feel we have helped Union Oil's contribution to the West.

Our own efforts to make rubber products increasingly useful to the Petroleum Industry have been marked by an attitude kindred to that which has been used to describe the spirit of the Union Oil Company. Like Union Oil, "Hewitt men don't build products that simply follow the old tradition. They build them to do the job".

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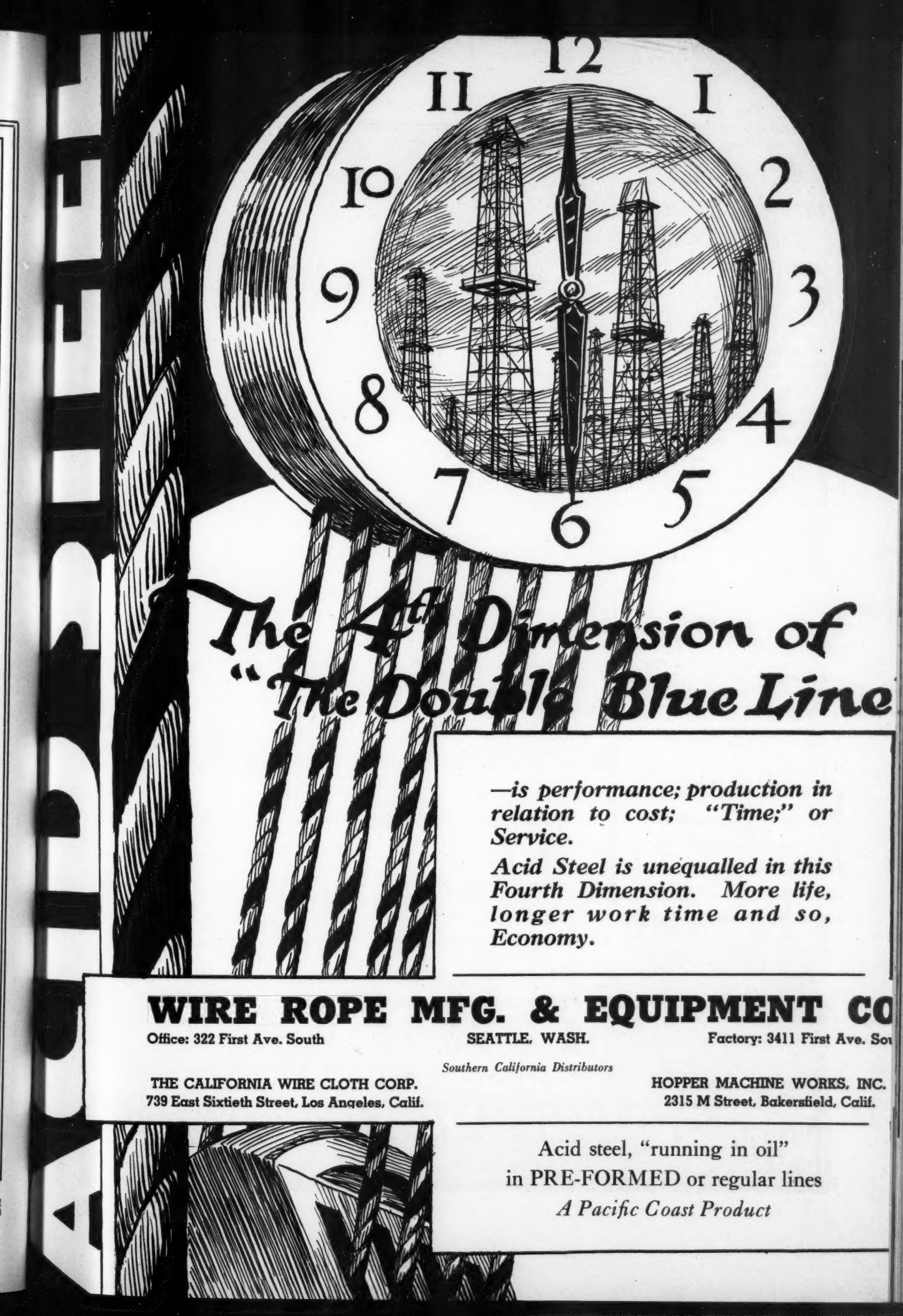

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Choice of 2, 3, or 4 power cylinders — 150 to 300 hp at conservative speed of 300 rpm.

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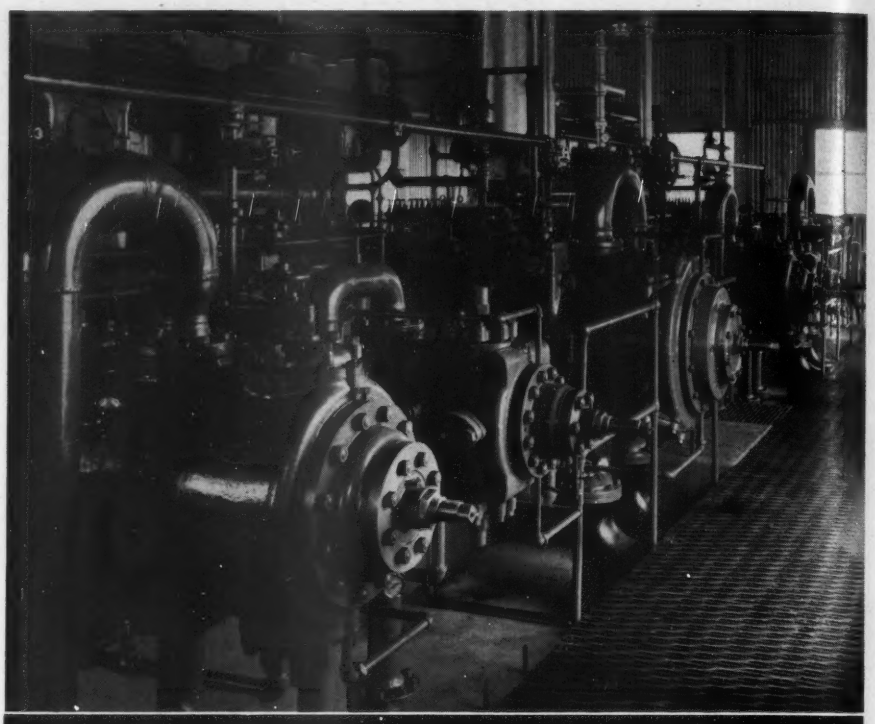
Choice of 1 to 4 compressor cylinders, single or multi-stage; any combination of volume and pressures.



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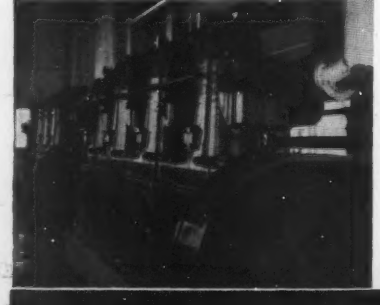
Cooper-Bessemer "angle" compressor units have been operating for more than a year in Union Oil Company's Rio Bravo gasoline plant. Each is a "four", rated 300 h.p. at 300 r.p.m. Their triple compressor cylinders work as follows: 19″ cylinder picks up tank vapors: 10½″ cylinder gathers low-pressure field gas; 6⅜″ cylinder helps boost the gas to 480 pounds pressure for the absorption plant.

SEND FOR G-MR BULLETIN!



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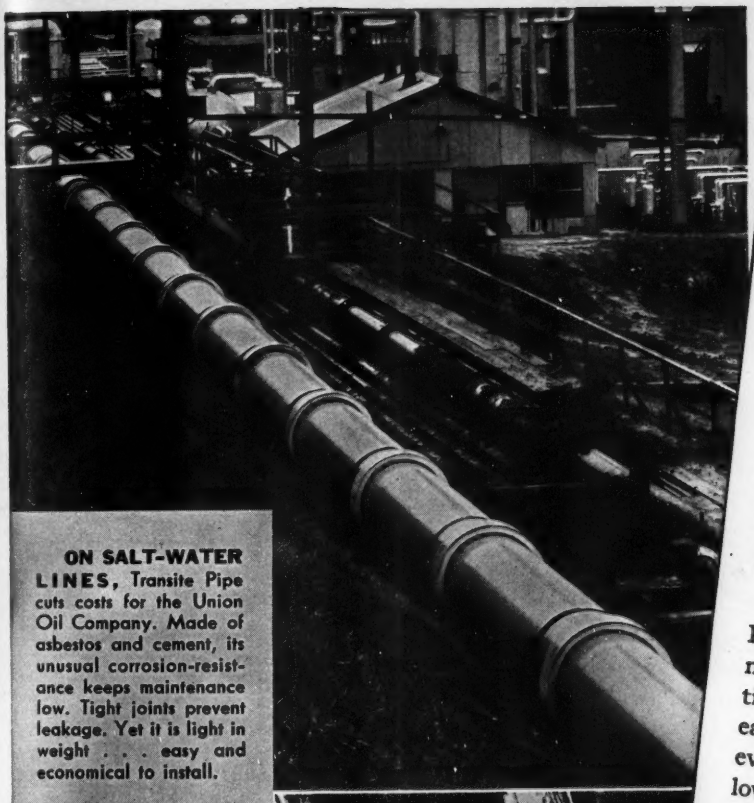

ON SALT-WATER LINES, Transite Pipe cuts costs for the Union Oil Company. Made of asbestos and cement, its unusual corrosion-resistance keeps maintenance low. Tight joints prevent leakage. Yet it is light in weight . . . easy and economical to install.

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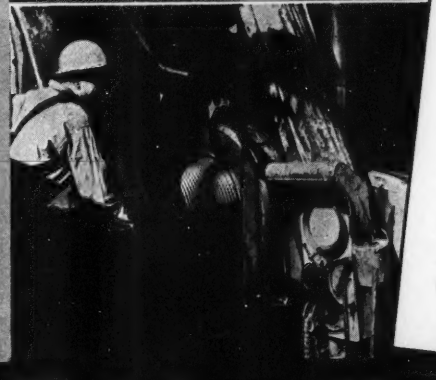
DRUM WEAR REDUCED on Union Oil Company rigs with J-M Rotary Lining. Users say this lining gives unusually even feed-off and easy load control. And it's tough and durable . . . gives long service even under difficult operating conditions.



Unusually strong and durable, J-M Products for the oil industry assure long life and low maintenance wherever used . . .

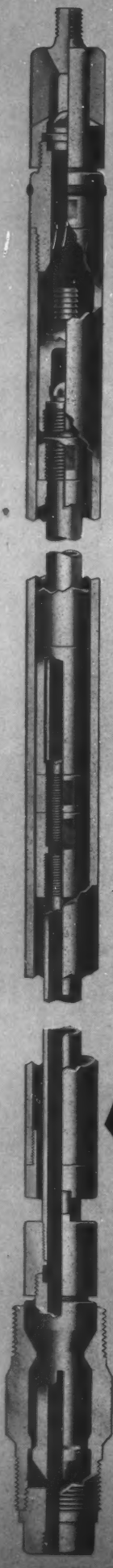
LIKE many other leading producers, the Union Oil Company is a steady user of Johns-Manville Materials. Here, as in oil fields and refineries all over the country, these products have proved their ability to deliver efficient, low-cost service.

On salt-water lines, Transite Pipe provides longer life with less maintenance. Tough, durable friction materials make rig operation easier and safer. Insulations for every temperature keep fuel costs low. And for many other oil-field or refinery requirements, there are J-M Materials that help reduce operating expense.

If you aren't familiar with the complete line of J-M Products for the oil industry, it will pay you to get full details. Just write Johns-Manville at San Francisco or Los Angeles.

Johns-Manville SERVICE TO THE OIL INDUSTRY

Packings . . . Insulations for every temperature . . . Friction Materials . . . Transite Pipe for lead lines and salt-water disposal . . . Underground Pipe Protection . . . Fireproofing . . .



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VIEWS and NEWS

Possibilities of Miocene Production
In the Inglewood Field

By W. E. (Steve) Dunlap
Consulting Geologist, Petroleum Engineer
Los Angeles

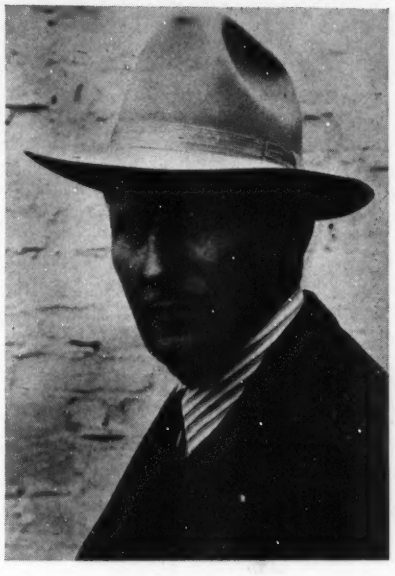
Much discussion has of late been aroused regarding the possibilities of Miocene production at Inglewood, particularly the northern portion, due to the starting of avowed deep tests both there and on the west flank of the old production.

Baldwin Hills is the most prominent topographical feature of the general uplift extending from Beverly Hills to Newport. Most of the important oil fields discovered in the Los Angeles Basin are along this uplift. These fields consist of Beverly Hills, Potrero, Rosecrans, Dominguez, Long Beach, Huntington Beach, and Newport. This group of hills forms a block rectangular in shape with steep escarpments on the north and west sides, the east and south sides sloping gradually to the plain of the Los Angeles Basin. The INGLEWOOD FAULT, which is also a prominent feature, is located to the northeast of the hills and is plainly visible on the surface, because the hills above the surrounding plan are cut by two deep erosion channels from northwest to southeast, and no doubt reflect the strike of this major fault.

The oil measures discovered to date occur in the upper Pliocene or Fernando formation and are stratigraphically higher than in all the other fields along this major uplift. Various outcrops, ranging from the Recent black soils, Pleistocene and Pliocene beds, can be found in several localities in the Baldwin Hills.

By referring to the map, it will be noted that the field represents an elongated dome approximately 11,000 feet long and 3,800 feet wide. The axis of this structure extends in a northwest-southeast direction. The structure is cut on the east by the major Inglewood Fault and a separate but smaller fold is indicated on the east. The fault has caused the beds on the east to be uplifted approximately four hundred feet over the same beds on the west. In other words, the major portion of the Inglewood Field lies on the down-throw side of this fault. It is believed by most engineers that this heads toward the southwest; core records of wells drilled close by the fault and on the west side substantiate the above statement.

It is interesting to note that the contours on the east side of the fault increase in depth towards the northwest, beginning in the northeast quarter of sec. 17; whereas the contours due west of the fault increase in depth in the southeast direction beginning at a point in the southwest quarter of sec. 8. This feature is probably indicative of a horizontal displacement along the fault in a southeast direction as well as a vertical displacement. The gravity of the oil found



"Steve" Dunlap

in wells east of the fault is somewhat higher than the gravities found in the major portion of the field, or west of the fault. This point, however, is only true of wells finished in the upper zones.

Commercial production was discovered in this field by the Standard Oil Company in its Los Angeles Investment well No. 1; located in sec. 17 near the extreme southeast edge of the field. This well was put on production in September, 1924. Since that time the field has been in process of development, especially in the years 1924, 1925, 1934, and 1936. During the first two years most of the wells were completed above the 2500 foot level; a few, however, were carried down to approximately 3200 feet, but it was not until eight years had passed when operators started to drill deeper and discover other productive measures.

Up to January 1st, 1940, Baldwin Hills has produced 116,552,025 barrels of oil. Total number of wells is 291 and the proven acreage, 860. That means that the Field has already produced 135,000 barrels per acre, from the present three zones.

The production for December, 1939, was 404,500 barrels, or an average of 1300 barrels per day. A great number of the old wells are shut in.

At the present writing, commercial production is now being obtained from wells ranging in depth from 2500 feet to 4500 feet.

The oil-bearing formations consist of alternating brown shales, sandy brown shales and oil sands. Productive measures to date have been developed through a measured thickness of 2850 feet, separated by occasional shale bodies and edge water-sands.

The gravity of the first oil sands encountered ranged from 13 to 18 degrees A.P.I. The second oil horizon, commonly known as the Rindge Zone, produced oil ranging in gravity from 18 to 29 degrees. The top of the Rindge Zone is approximately 700 feet below the top of the first oil zone. The top oil zone is sometimes referred to as the Tar Zone. Initial productions, ranging from 1000 barrels to 4000 barrels daily, were not uncommon in wells finished during the early stages of development at depths of less than 2500 feet. Zones developed below 2500 feet and as deep as 4500 feet during the years 1934, 1935, and 1936, have shown greater saturation and much higher gravities. One of the most recent wells to be completed was Kettleman & Inglewood Corporation Rubel No. 23, located on the axis of the structure. This well was drilled to a depth of 4020 feet; the 8⅝ secondary water-string was cemented at 3375 feet; the 6⅝ liner was perforated from 3392 feet to 4020 feet—a total of 628 feet of oil sand. The well was completed on January 29, 1936, with an initial production of 2700 barrels per day of 32 gravity oil. It is interesting to note that after approximately eleven and a half years from the completion of the discovery well, production of this amount and quality was obtained from lower zones. This horizon is now known as the Rubel Zone and a great number of wells similar to the above have been completed in this zone and are still flowing. From a geological standpoint it is almost certain that this production occurs in sands in the lower part of the upper Pliocene and, in my opinion, other oil measures occurring in the lower Pliocene can reasonably be expected during future development.

In April, 1934, a well was started known as the Plymouth Oil Company "Pollard No. 1". In October, 1934, the well name was changed to Smith No. 1, and for purposes of this discussion the well will be designated as "Plymouth-Smith No. 1".

After the 14 in. casing was cemented

on May 7, 1934, at a depth of 201 ft., the well was drilled to a depth of 4040 ft. Many cores were taken and an electric log was run to this depth. Referring to the cross-section, you will note that the Plymouth-Smith well No. 1 has been projected onto the section, which shows at a glance just where the various oil sands were encountered and in which zones they lie.

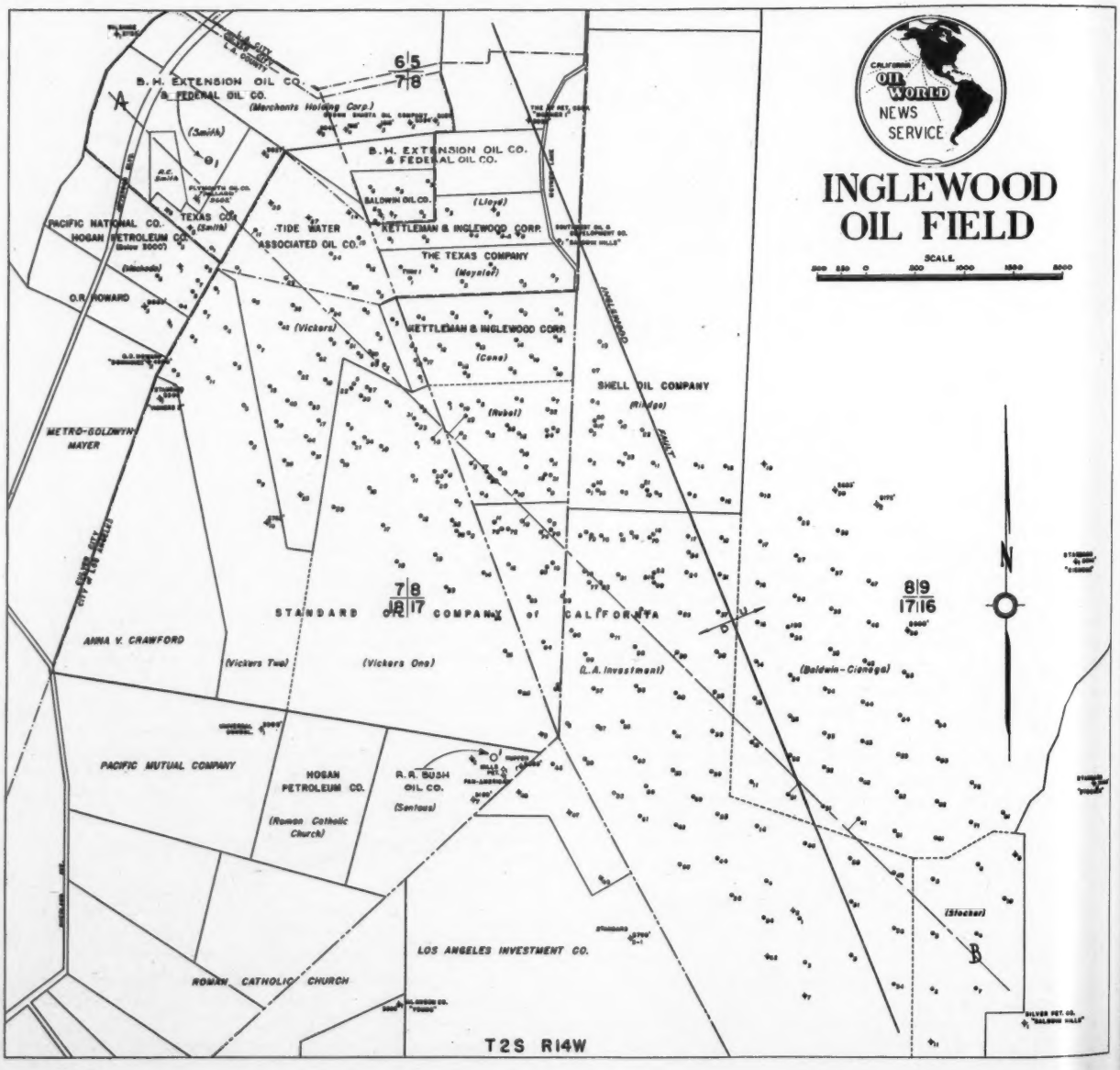
On June 7, 1934, the 9 in. 40 lb. casing was cemented at 3952 ft. with 750 sacks cement, in a 13 in. rotary hole; this point is approximately 352 feet below the top of the Rubel Zone. So repeating again—no zones were tested above this point, although the electric log shows that the top of the Rubel Zone, beginning at 2582 ft. down to 3832 ft., certainly warranted a formation test.

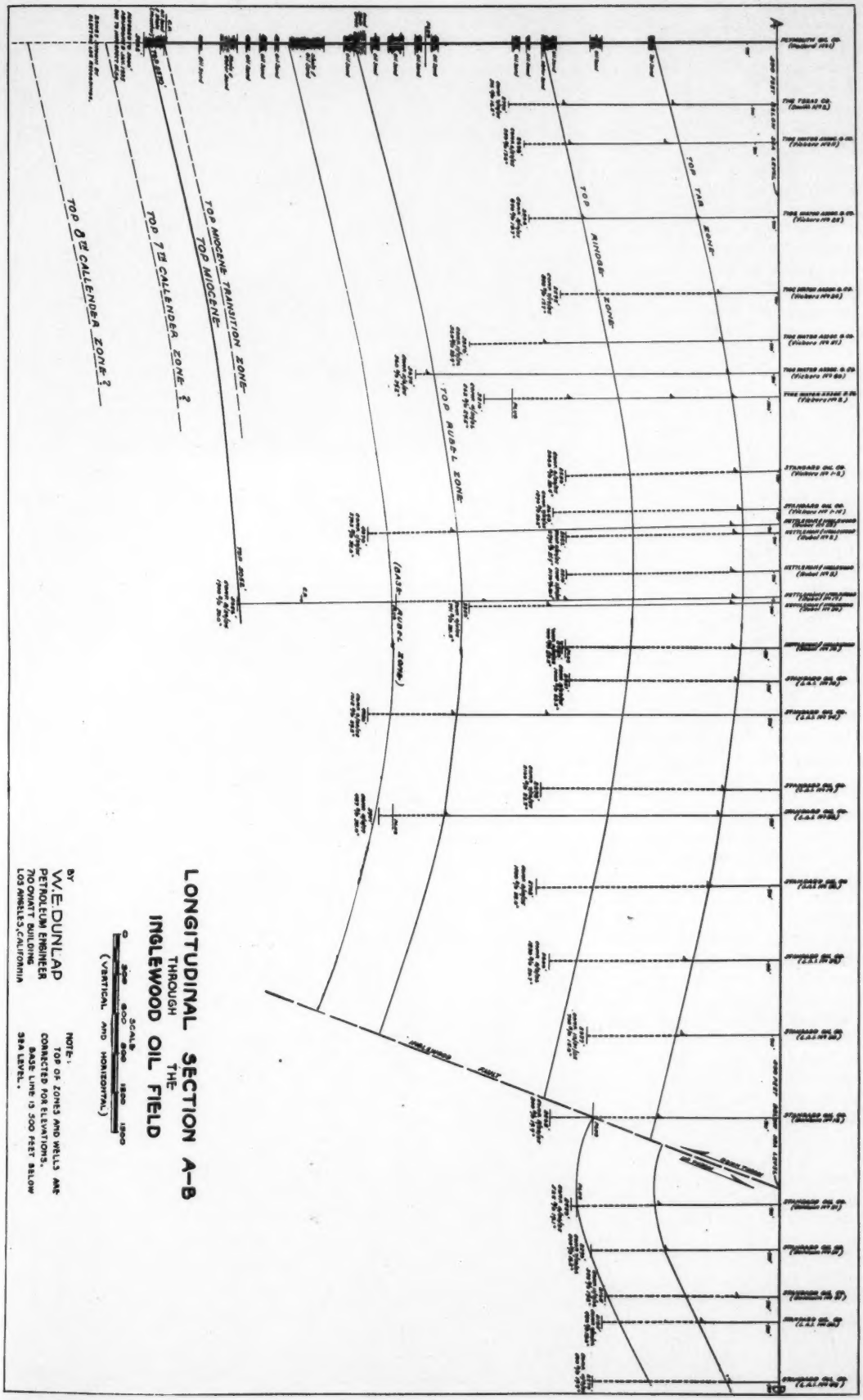
The test on the 9 in. shut-off was unsatisfactory so the casing was re-cemented on June 13, 1934, and 27 sacks of cement were put away behind the casing under 8000 pounds pressure. The test on the recement job was also unsatisfactory, but approval was given to continue the well to a depth of 4602 feet.

The electric log shows that the oil sands from 3959 ft. to 4032 ft. should have been productive and it is quite possible that, had the test on the water-string been effective, commercial production could have been obtained from the above zone.

After a depth of 5602 feet was reached, the electric log was run to this point and then the 5¾ in., 22½ lb. casing was landed at 5602 ft. and cemented through perforations at 5432 ft. with 275 sacks of cement. The lower portion of the casing was perforated and a production test made. When the well was swabbed to 4000 feet the fluid rose 200 feet in sixteen hours and contained all oil. However, the Division of Oil and Gas report shows that the company decided to gun-perforate other zones above this point and below 4032 ft.

From examination of the electric log and then studying the cross-section, it is probable that the sands encountered between depths of 3582 ft. and 4470 ft. occur in the Rubel Zone. The sands encountered from 5444 ft. to 5586 ft., no doubt are virgin sands that have never been encountered or tested in wells west of the Inglewood Fault. Eye witnesses at the production test from the C. P. point (5432 ft.) to bottom, state that this interval was capable of producing at least 250 barrels per day of 39 gravity oil. It was noted during the production test that when the well was swabbed to 5000




LONGITUDINAL SECTION A-B
THROUGH
THE
INGLEWOOD OIL FIELD
SCALE
(VERTICAL AND HORIZONTAL)
BY
W. E. DUNLAP
PETROLEUM ENGINEER
710 OHATT BUILDING
LOS ANGELES, CALIFORNIA
NOTE:
TOP OF ZONES AND WELLS ARE
CORRECTED FOR ELEVATIONS.
BASE LINE IS 500 FEET BELOW
SEA LEVEL.
TOP MIOCENE TRANSITION ZONE
TOP MIOCENE
TOP 7TH CALLENDER ZONE ?
TOP 8TH CALLENDER ZONE ?
TOP RUBEL ZONE
TOP TAR ZONE
TOP RINDGE ZONE
(BASE RUBEL ZONE)
INGLEWOOD FAULT

ft. the fluid rose 450 ft. in four hours, mostly salt water. Deductions from this test lead one to believe that the C. P. job was ineffective and that the low head waters behind the C. P. point had access to the sands below, when the well was swabbed to 5000 ft. Cores taken from 5400 to 5588 ft. were examined by an eminent paleontologist who states that the top of the Miocene in this well can be placed at approximately 5520 feet. This being true, it is very apparent that the sands encountered below the C. P. point occur at the contact or in the transition zone between the Pliocene and Miocene.

After the company tested the zone from 5432 ft. to 5602 ft., and it was found to be, in their opinion, unsuccessful, the well was plugged back in stages and the several zones indicated on the electric log above were gun-perforated and tested. All the tests proved to be unsatisfactory. No zones were tested, however, above 4380 ft.

The 5¾ in. casing was then cut and pulled from 3400 ft. and a cement plug consisting of 10 sacks was dumped in at 3400 ft. The top of the cement was located at 3370 ft. and location and hardness of the plug at this point was approved by the State Division of Oil and Gas.

It can readily be seen that since the test on the 9" cement job was ineffective and the test on the C. P. job on the 5¾ was inconclusive, any tests made of zones between these points by gun-perforating could never have been favorable because the infiltrated waters were never squeezed off at any given interval.

There is much evidence to believe that this well could have been made to produce commercial oil from intervals of 3595 ft. to 4032 ft. and from 5432 ft. to 5602 ft. Other sands that were encountered might be wet, but the sands mentioned above show no evidence of the existence of water on the electric log.

It is a well known fact that Miocene production has been obtained in the Potrero, Rosecrans, Dominguez, Long Beach, Huntington Beach, and Newport fields. As stated elsewhere in this report, all these fields are located on the general uplift extending from Beverly Hills to Newport. The Baldwin Hills, or Inglewood field is located four miles northwest of the Potrero field on this same general uplift. The writer has found no evidence whatsoever that would lead any engineer to state that no commercial production will be found in the Miocene formation underlying the Pliocene in Baldwin Hills. The writer realizes fully that when structures approach in the northwest general trend towards the Santa Monica Range, the position of the basal complex becomes shallower. However, several wildcat wells have been

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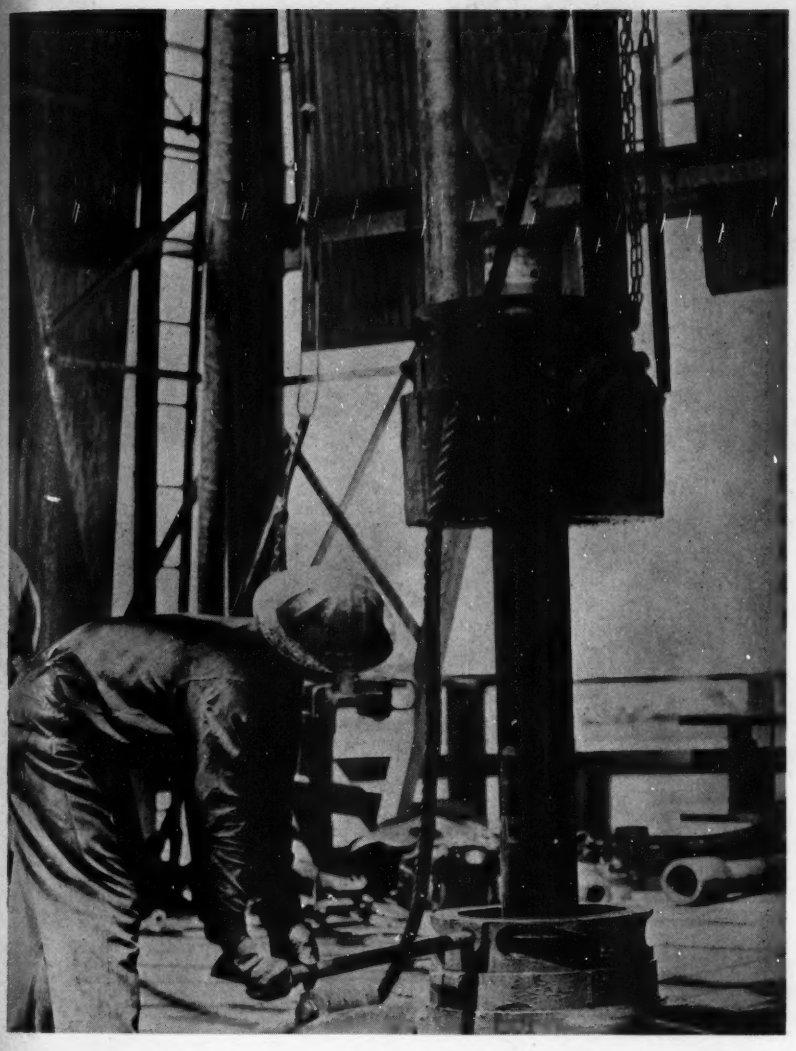

With modern equipment and well trained men, the oil companies are scoring achievement records daily.

drilled in the Palms area considerably northwest of Baldwin Hills. Some of these wells are over 6000 feet deep and no basal complex has been penetrated. The Palm Ridge Company drilled to 7142 feet and bottomed in Repetto or lower Pliocene.

The Del Rey Field, due west of the Inglewood Field, encountered Miocene production overlying the conglomeratic Schist beds. Apparently we can eliminate any possibility of reaching the basal complexes in Baldwin Hills before the Miocene beds have been penetrated at least 1000 feet.

There have been only a few wells in the Baldwin Hills that have been drilled deeper than 4500 feet. The Standard Oil Company "Cienega No. 105" well was drilled to a depth of 6284 ft. Many formation tests were made in this well but were found to be inconclusive due to the packer on the tester failing to hold in the open hole. It is reported that the top of the Miocene in this well was found at 6000 ft. This well is located approximately 500 ft. east of the Inglewood Fault and is no indication of what the possibilities for Miocene production would be west of the Fault and in a more favorable location.

After studying many electrical logs run in wells completed recently in the Dominguez Field, it appears that several points on said logs can be correlated with points indicated on the electric log run in the Plymouth-Smith No. 1 well. This is especially true between the intervals of 4000 and 5600 ft. in the Smith well.

The average depth to the top of the Miocene shown by electric logs and by core examination is approximately 6400 feet. This applies to wells completed near the westerly portion of the Dominguez Field. The top of the 7th Callender Zone which has been found to be very productive in the Dominguez field is between 350 and 400 ft. below the top of the Miocene and averages 250 ft. in thickness. The top of the 8th Callender Zone in the same field ranges from 850 to 1000 ft. below the top of the Miocene and has an average thickness of 125 ft. The top of the 9th Callender Zone is approximately 1300 ft. below the top of the Miocene; this zone has an average thickness of 150 feet. The Union Oil Company has also encountered a 10th zone on the Callender lease, but to date little is known of its commercial value.

(Continued on Page 64)

Two experts, one for Richfield, left, and the other for Texaco, pronounce a favorable verdict on a Hughes bit's footage.

CONTROLLED VERTICAL DRILLING IS *THIS*

HERE is a chart of the course of a typical controlled vertical well. Note that the entire course of the well is within very close limits of a vertical line, and that the angles are low.

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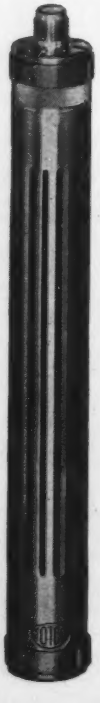

HOW INCLINATION RECORDS ARE USED TO CONFINE THE COURSE OF THE HOLE TO VERTICAL

A single record taken at any point and considered alone can only serve as a slope-test. In order to practise controlled vertical drilling the driller must be informed as to whether the angle of the hole is increasing, decreasing, or remaining the same. This information is gained by considering two or more records taken at close intervals (50 to 100 feet apart is recommended). If these records show an increasing angle, he immediately changes the drilling weight and speed to reduce the angle while it is small. The drill string acts as a plumb-bob, and tends to return to vertical when it is in tension; the bit, therefore, cuts away toward the *low* side of the hole when drilling weight is reduced, returning the hole toward vertical.

The Totco recording instrument (above right) is encased in a fluid tight go-devil while being run through the drill pipe. Two go-devils (A) for running on measuring line, and (B) for drop-in use, are shown.

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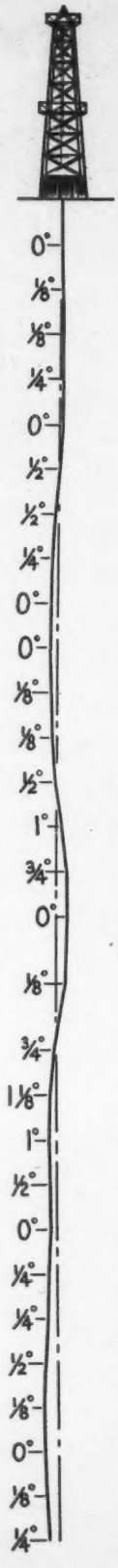

NOT THIS

This is a controlled directional well. Readings of both vertical angles and direction are essential, and special drilling tools, deflecting equipment, and highly skilled supervision are required.

NOT THIS

A crooked well costs more and requires more drilling time than a controlled vertical well. Slope-testing, the practice of taking vertical angle readings just to determine whether or not the contract limit is exceeded, is NOT controlled vertical drilling.

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Bottom Hole Control of Gas Production

To Improve Gas-Oil Ratio

A. P. I. Pacific Coast Spring Meeting 1940

By
E. W. McAllister
Kettleman North Dome Association
Avenal, California

The bottom hole chokes or flow controls discussed herein were designed primarily for use in fields having an overlying gas cap which can be isolated from the lower oil producing sands. More and more installations are being made in fields of this type as operators become gas conservation minded either because of legal aspects or in an effort to conserve reservoir energy.

The bottom hole chokes or flow controls are designed to permit the passage of gas into the tubing string from the annular space between the tubing and the casing. The equipment differs from the pressure differential and velocity type flow or kickoff valves in that the flow of gas through the device is controlled by various sized orifices which may be changed or adjusted from the surface by means of tools run on a small wire line (.006- or .007-inch diameter).

The location of this equipment in the tubing string is fixed and cannot be changed without raising or lowering the tubing; hence, before its installation it is necessary for the operator to predetermine as nearly as possible the location of the choke and the auxiliary equipment so as to accomplish the results desired.

At present there are two general types of controls in use; these have been designated as Types I and II for purposes of discussion only.

Type I (Figure 1) is composed of a landing nipple or shoe (No. 1) constructed with a recess for locking the removable control device or choke (No. 2) in place. The landing nipple is inserted in the tubing string between tubing collars and has four ½-inch fixed ports (No. 3) for the passage of gas through the shell.

The removable choke (No. 4), when in place in the landing nipple, controls the gas entering the tubing by two holes (No. 5) drilled diametrically to each other in the choke body. Ordinary fiber

E. W. McAllister

pump cups (No. 6) placed above and below the gas entry ports prevent the gas from bypassing the control holes in the choke body. The size of the holes required in the choke body is determined by trial flow tests of the well with the choke in place.

The removable choke is lowered into place by means of a running tool equipped with jars on a small wire line. The choke is fastened to the running tool by four small studs projecting through holes in the running tool into a groove (No. 7) in the top of the removable choke. When the choke is placed in the landing nipple it is automatically locked there (No. 2) and the running tool is disengaged from it by shearing the small studs by jarring.

To remove the choke a pulling tool equipped with jars is lowered on the small wire line until it contacts the choke. A guide slips into the choke bore and dogs engage the choke, slipping over a shoulder (No. 8) on an extension of the locking device. The choke is jarred down, releasing the wedging action locking the choke in place. The locking device is then pulled clear of the recess and the choke is free for removal.

In case of difficulty in jarring the choke loose the pulling tool is designed so that continual jarring will shear a pin, releasing the dogs, permitting the pulling tool to be removed without the choke; heavier tools can then be run to jar the choke loose.

The use of the standing valve (No. 9) is optional. Its principle value is that in a shut-in well, it will prevent the transfer of gas from an upper zone to a lower zone which otherwise have been isolated from each other.

The bore of the removable choke, Type I, is not of sufficient size to permit the passage of subsurface pressure instruments. Instruments of small diameter may be run through the landing nipple with the choke and standing valve removed. The clearance through the landing nipple can be increased by turning out the seats for the standing valve if this device is not used.

The Type I bore diameters for the different sized landing nipples and chokes are as follows:

Size	Through Standing Valve Seat	Main Bore	Choke Bore
2″	1½″	1¾″	⅝″
2½″	1¾″	2⅛″	⅞″
3″	2½″	2¾″	1⅛″

The Type II flow control (Figure 2) is composed of a cylindrical shell (No. 1) containing an adjustable sleeve (No. 2). The shell has four ½-inch fixed ports (No. 3) for the passage of gas into the tubing. Various sized ports (No. 4) in the adjustable sleeve can be matched with the ports in the shell, thus controlling the entry of the gas. The control ports in the sleeve vary in size from a minimum opening of one ⅛-inch port to a maximum of four ½-inch ports.

The sleeve is held in position by a spring friction device (No. 5) which rides in grooves in the lower part of the sleeve. The sleeve is adjusted by means of a setting tool consisting of a mandrel threaded on the outside for a collar which can be locked into position on any part of the threaded section of the mandrel. The setting tool, equipped with jars, is lowered on a small wire line until the lower end of the mandrel comes to rest on the top of the adjustable sleeve. By jarring, the sleeve is then moved downward until the adjustable collar on the mandrel comes to rest on a shoulder (No. 6) in the top part of the shell. This prevents any further jarring from moving the sleeve until the setting tool has been pulled to the surface and the collar readjusted. The setting tool is marked so the collar may be set for any opening desired in the flow control.

To return the sleeve to its top position, closing the gas entry ports, a spear equipped with jars is lowered on the wire line into the bore of the adjustable sleeve. An expanding device on the lower end of the spear locks the spear in

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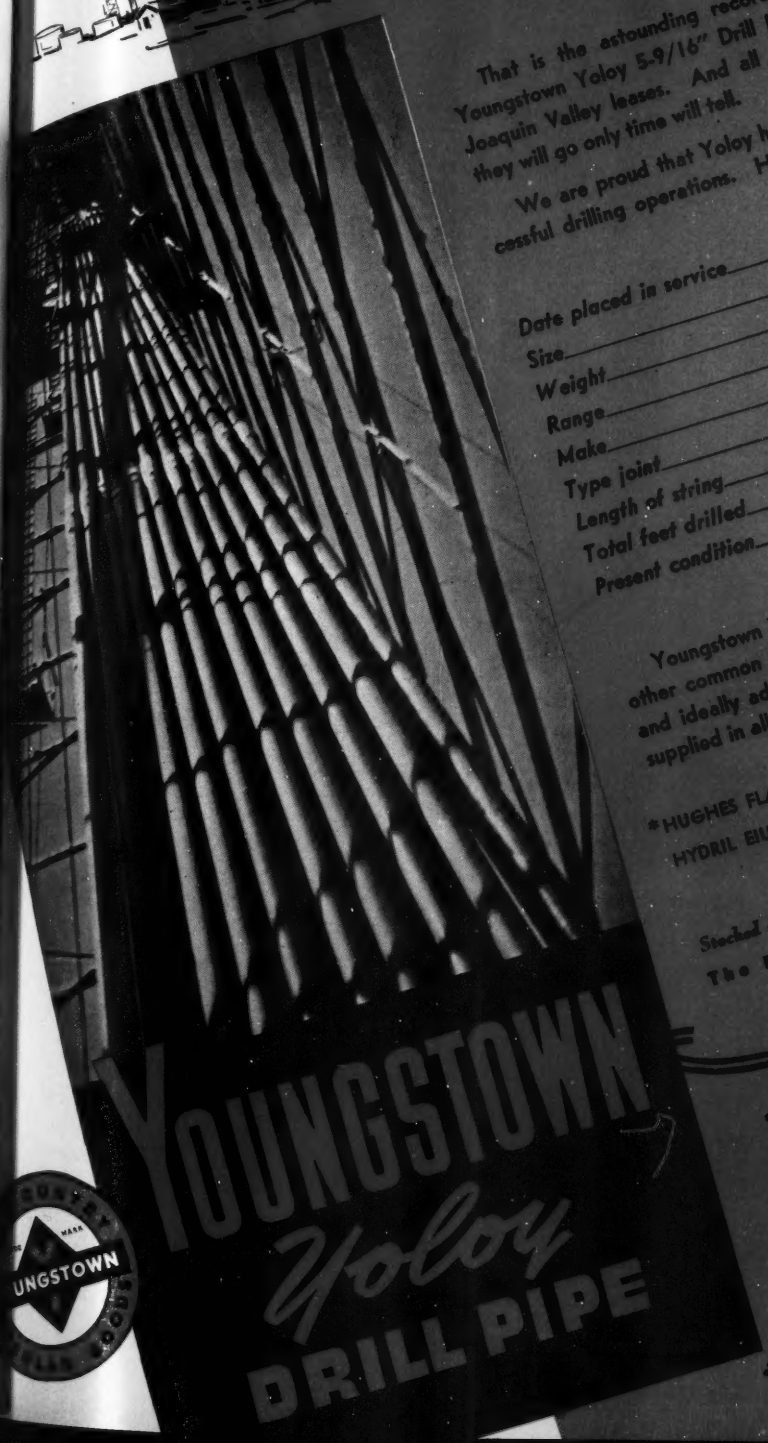

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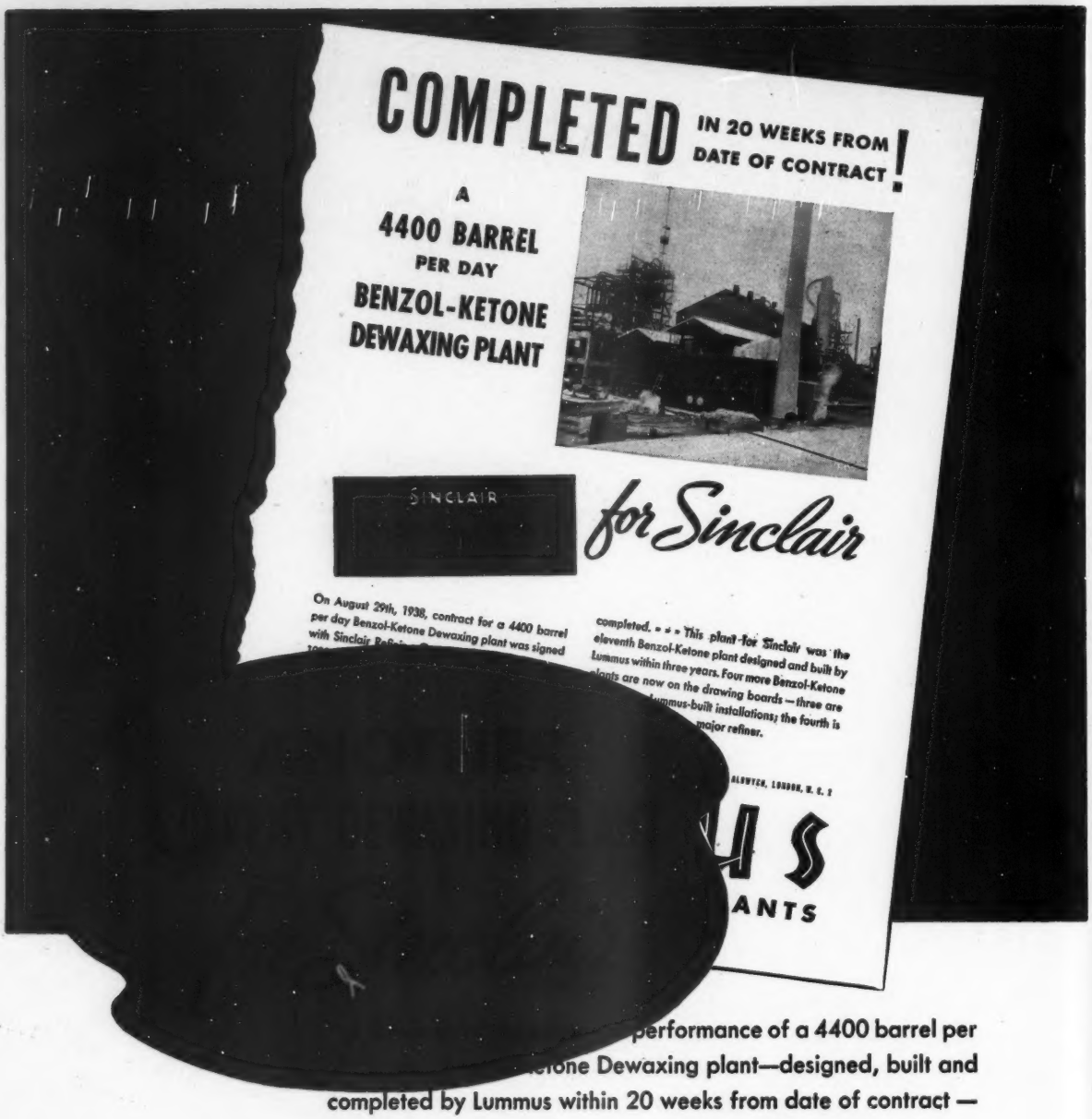
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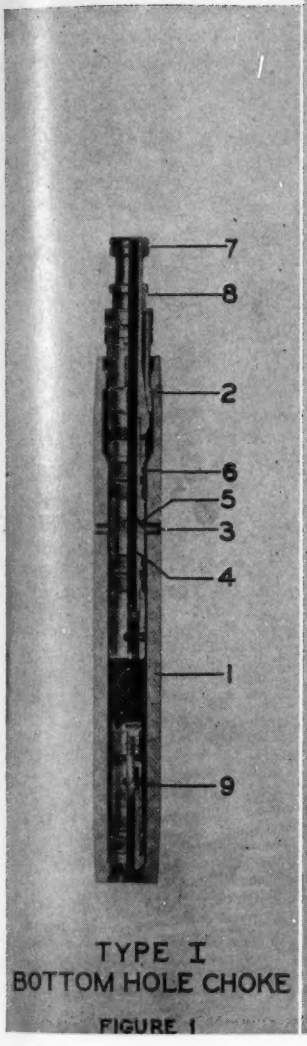
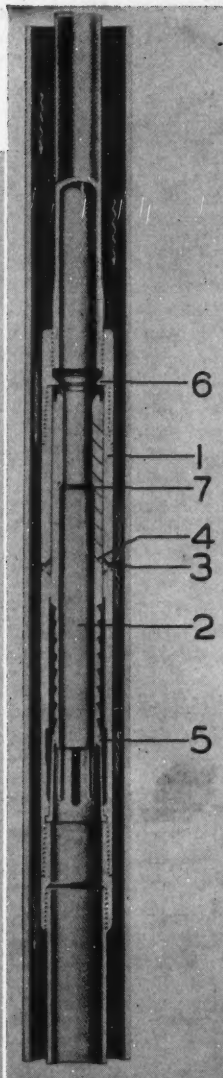


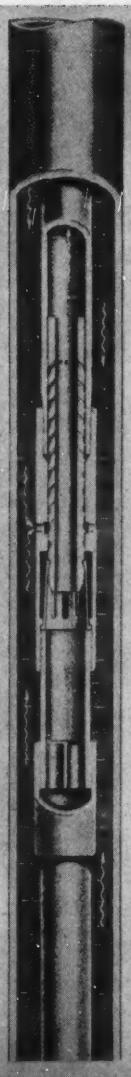
TYPE I
BOTTOM HOLE CHOKE

FIGURE 1



TYPE II
FLOW CONTROL

FIGURE 2



TYPE II
FLOW CONTROL

FIGURE 3

the bore of the flow control sleeve below a shoulder (No. 7) for this purpose. The sleeve is jarred into its top position and the spear released by continuing to jar until a pin in the spear is sheared, releasing the expanded device.

The bore of the adjustable sleeve is 1⅞ and 2¼ inches, respectively, for the 2½ and 3-inch flow controls, permitting the passage of subsurface instruments.

A new feature being offered in the Type II flow control is an adjustable sleeve which may be removed and replaced by means of a wire line. This equipment is shown in Figure 3. The sleeve is lowered into place attached to a running tool by a very light wire. When the sleeve is in place in the friction device the running tool is disengaged by pulling the retaining wire in two.

The sleeve is adjusted by jarring down on it until an adjustable extension of the setting tool, which passes through the bore of the sleeve, comes to rest on a stop below the sleeve. To return the sleeve to its top position it must be removed completely from the well and rerun as described previously.

Both types of chokes or flow controls may be adjusted or changed under pressure by means of a lubricator such as is used in running subsurface pressure instruments. It is safe practice, and necessary in wells of high pressure, to shut a well in and equalize the casing and tubing pressures through the surface connections prior to making any adjustments, thus averting any possibility of releasing suddenly a discharge of gas or oil under pressure which may blow the tools up the hole and kink the wire line.

Jars of 20- or 24-inch stroke are used in adjusting or changing the flow controls with sinker bars weighing from 20 to 46 pounds placed immediately above the jars. The pins in the pulling and setting tools are sheared easily if a good sharp blow can be obtained with the jars. The jars and weights should not be too heavy or else the operator in working the jars expends all his energy in stretching the wire line with little or no "snap" in the movement of the jars.

After a little practice an operator becomes accustomed to the amount of stretch to expect in the wire line and the feel of the "pickup" of the jars. To operate the jars the wire line is reeled in until the jars just begin to open. The brake is set on the wire line hoist and the operator takes a position where he can give the wire line a sharp push downward or a pull sideways. The sales companies handling the bottom hole chokes will furnish and operate wire line equipment for a nominal service charge.

The most common use of the bottom hole choke or flow control is to install it in the tubing string opposite a gas zone that has been isolated from a lower oil producing sand by means of a packer run on the tubing and set in a cemented blank section between the two zones (Figure 6). Gas is admitted to the flow string via the flow control and gas lifts the oil which enters from below, to the surface.

Care must be taken in this type of installation that too much slack is not left in the tubing after setting the packer. It has been found by test that in setting a packer on 7000 feet of 2½-inch tubing if more than 36 inches of slack tubing are run in the hole the coiling or bending of the tubing causes so much friction or drag on the wire it is difficult to operate the jars if possible to operate them at all.

The following tabulated data give results obtained from a packer and flow control installation made in Kettleman Hills. The packer was set at 7600 feet on 3-inch tubing in a cemented blank section between the gas and oil zones, with the flow control located at a depth for 7439 feet. Tests were made before and after the equipment was installed and for various openings of the flow control.

Inasmuch as subsurface condition vary in each well these data are characteristic of this installation only.

In the Montebello field operators are making similar packer and flow control installations for the purpose of establishing high gas and oil potentials as well as for controlling the gas under normal

Prod. Bbls.	G/O Ratio Cu. Ft./Bbl.	Pres. Lb./Sq. In. Tubing	Casing	Remarks
920	10,400	180	810	Producing all zones; no packer or flow control
940	990	145	Packer	Producing below 7600 ft. only (Packer)
1070	2,620	225	860	Flow control orifice 15/64" diameter.
967	3,345	430	830	" 47/64" "
1228	3,415	225	800	" 47/64" "
606	4,930	580	880	" 47/64" "
1010	900	210	...	" closed
785	4,220	450	800	" 9/16" "

operating conditions. For potential tests the choke is opened fully, thus adding the area of the tubing to that of the casing in order to obtain the maximum gas potential for the well.

In this field the total gas production is allocated to the individual operators on the basis of their gas potentials in the same manner as the allocation of oil is made by the State Oil Umpire.

Packer and flow control installations are made also in the Amerada area in the new Coalinga fields. Operators in this field have run, in addition to the orifices for controlling the gas, an orifice attached to the bottom of the choke, Type I, (Figure 1) for beaning the flow of oil from below the choke. This eliminates large pressure differentials through the surface beans, minimizing the possibilities of freezing. Both orifices are integral with the choke body and can be removed at the same time.

After an operator has determined the right combination of orifices to produce the oil desired without excessive gas production through the tubing, he leaves the choke in place. Fluctuations in gas demands are handled from the casing through the surface connections without disturbing the bottom hole choke. Data on one such installation are as follows:

Bottom hole choke depth.....8170 ft.
Two gas orifices.....3/32" diam.
One oil orifice.....5/64" diam.
Daily oil production.....181 bbls.
Daily gas production.....1500 MCF
Tubing pressure.....710 Lb./Sq. In.
Casing pressure.....2825 Lb./Sq. In.

It is estimated that 1400 MCF of the gas are produced through the casing surface connections.

An interesting side light on this installation is that the gas produced through the surface casing connections is "sprayed" by means of a special mixing valve into the tubing flow line downstream of the tubing bean. This procedure has increased the gravity of the oil and raised the temperature of the casing gas above the critical point where hydrates start to form.

Flow control installations without packers were made recently in Kettleman Hills wells to facilitate gas lifting the wells. The wells which had ceased to produce by natural flow were located in an area a considerable distance from any gas lift facilities carrying gas at sufficient pressure to gas lift the wells tubed at the normal depth of 7000 feet, more or less.

Gas was available at 480 pounds pressure near this area. As a temporary expedient, until the higher pressure gas lift facilities were extended to the area, flow controls were installed in the tubing at a depth calculated to require approximately 450 pounds pressure to gas lift the wells. The depth for setting the flow control, approximately 6000 feet, was determined by the intersection of theoretical casing and tubing pressure traverses plotted as follows and shown on Figure 4.

Starting with 450 pounds surface pressure a casing pressure traverse using a gas gradient of .008 pounds per foot was plotted against depth. Similarly, a tubing pressure traverse was plotted starting with a surface pressure of 140 pounds, at which it was desired to produce the wells, and using a tubing flow gradient of .06 pounds per foot. The intersection of these pressure traverses indicates the location of the flow controls for the conditions assumed. The gas and flow gradients used were determined empirically from subsurface pressure studies made in numerous other wells.

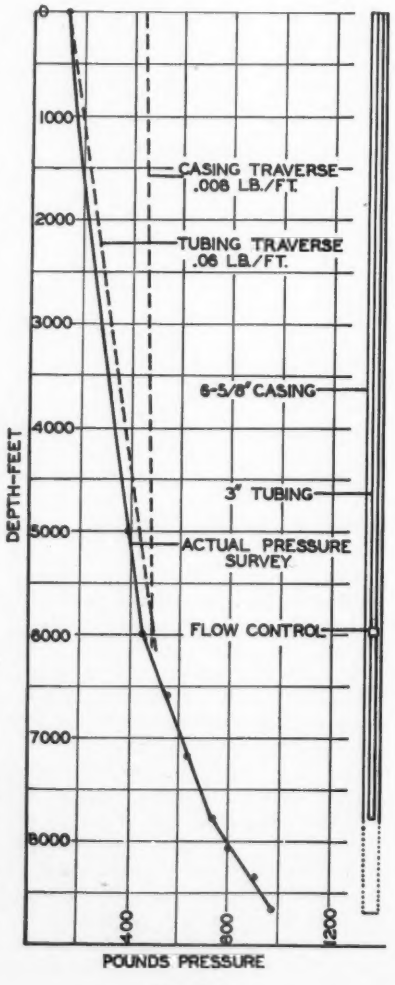


FIGURE 4

An actual pressure survey made after one flow control installation is plotted also on Figure 4. Production data for the time the pressure survey was made are as follows:

509 Bbls. of oil.
27 Bbls. of water.
1626 MCF of circulated gas.
152 MCF of formation gas.
136 Lbs./Sq. In. tubing pressure.
440 Lbs./Sq. In. casing pressure.

The flow controls are wide open as the gas lift gas is controlled at the surface. When gas at higher pressures is available, it will be necessary only to close the controls in order to gas lift the wells from the bottom of the tubing string.

Under certain well conditions, and if the maximum oil production is desired, it is a distinct advantage to have the point of gas entry as deep as possible in the well in order to obtain the full benefit of gas lift.

The equipment shown in Figure 5 is for this purpose. It is constructed so as to convey the gas from an upper zone through the annular space of two tubing strings to any point below the packer. The gas control mechanism is adjusted as described previously for the Type II bottom hole choke.

The advantages of an installation of this type will be greatest in a well of low formation pressure with a long producing interval below the packer from which little formation gas is produced. This is illustrated graphically by the subsurface pressure survey and flow control installation shown in Figure 6. The production data for the time the pressure survey was made are as follows:

256 Bbls. of oil.
168 Bbls of water.
1941 MCF of formation gas.
140 Lbs./Sq. In. tubing pressure.
400 Lbs./Sq. In. casing pressure.

Referring to the pressure traverse, Figure 6, attention is called to the change in flow gradient occurring at the flow control due to gas entering the tubing at this point. The flow traverse above the flow control has been extrapolated to Point "A" near the bottom of the well.

The extrapolation indicates the prob

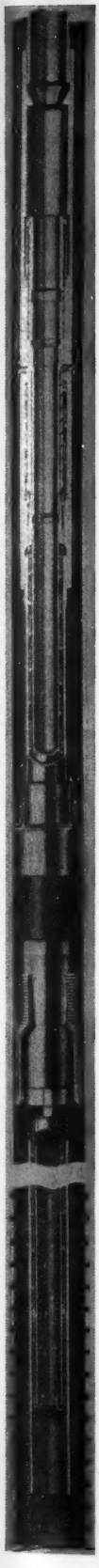


FIGURE 5
TYPE II
FLOW
CONTROL

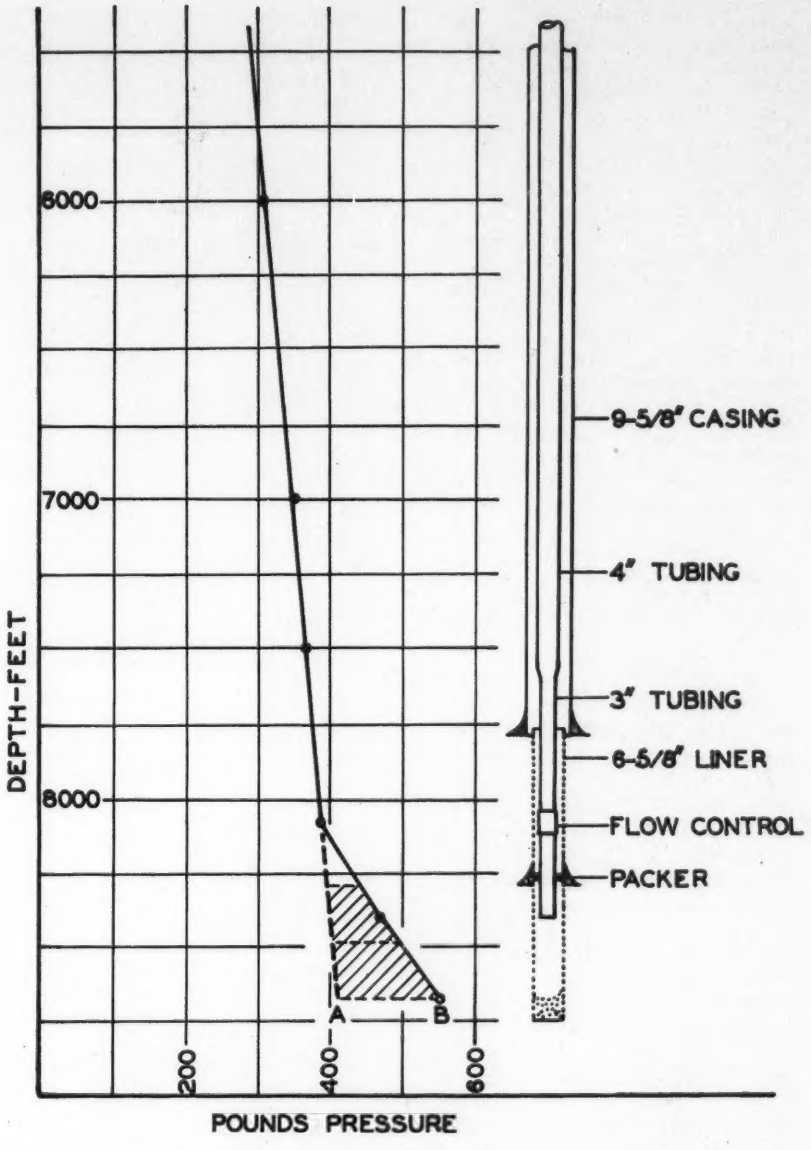


FIGURE 6

able flow traverse in the tubing had the gas been conducted to and released into the flow stream at Point "A" instead of at the flow control; this would have resulted in a decrease in pressure against the formation of approximately 140 pounds at Point "A" (pressure difference between Points "A" and "B") or a reduction in the mean pressure against the formation of the lower producing interval of approximately 90 pounds (shaded area, Figure 6). In this particular well which had a productivity index of 2.00, the oil production would have been increased approximately 180 barrels.

Summary and Conclusion

The flow controls described in this paper are ingenious and effective devices for the control of gas/oil ratio (upward). Details of design and performance are quoted. It is regrettable from the standpoint of ultimate recovery that competitive conditions require the utilization of reservoir energy in the manner mentioned, but granting this, the flow controls fill a need.

* * *

Acknowledgement is made to the following for their help and cooperation in preparing the data for this report:

T. R. Tinker, Union Oil Company,

George Scott, Western Pressure Control, Inc.,

Joe Stephens, Kern Oil Company,

Paul Dugmore, Rasmussen Service Company, and,

Kettleman North Dome Association.

(Continued from Page 55)

Only a few wells have penetrated the 9th zone. However, the 7th and 8th Callender zones are now the most prolific in the Dominguez field.

It can be seen that the top of the Miocene recorded in the Plymouth-Smith No. 1 well is about 875 ft. higher in measured depth than the top of the Miocene found in the Dominguez field. It is therefore assumed that a well drilled on the Smith property at approximately the same location as the old well should encounter the top of the 7th Callender zone about 5900 ft. and the top of the 8th Callender zone at 6500 ft.

Beyond all doubt, the Inglewood field deserves an adequate test such as is contemplated in the project of Federal Oil Co., the location of which is seen on the accompanying map on the Ron C. Smith property.

L. L. Aubert Re-elected Oil Producers Agency Head

L. L. Aubert, president of the Oil Producers Agency for the year 1939-40 was re-elected to the same office for the ensuing year, 1940-41, at the regular annual meeting of the Agency board held yesterday. Mr. Aubert, general manager of the Bankline Oil Co., is also chairman of the Allocation Committee of the Central Committee of California Producers, a director of the United Landowners Association, vice president of California Petroleum Safety Board, president of the Manufacturers Natural Gasoline Corp., a director of the Independent Petroleum Association, and is also identified with various Pacific Coast activities of the American Petroleum Institute.

Other officers chosen at the meeting were: Maurice Machris, Wilshire Oil Co.; C. C. Spicer, Republic Petroleum Co.; L. A. Cranson, Honolulu Oil Corp.; and C. A. Johnson, Holly Oil Co.; vice-presidents: W. A. Russell, Seaboard Oil Co., secretary-treasurer; D. P. Murdy, Wilshire Oil Co., assistant secretary-treasurer.

Rush M. Blodget, manager and executive vice-president of the Agency since its organization, was continued in office as executive vice-president.

Election of one-third of the board membership for three year terms saw E. E. Bennett, Union Pacific Railroad Co., newly elected and W. L. Adkisson, Taft Investment Co.; L. L. Aubert, Bankline Oil Co.; H. A. Bardeen, Bardeen Oil Co.; R. A. Broomfield, Barnsdall Oil Co.; W. S. Fisher, W. M. & M. Oil Co.; Robert S. Lytle; C. C. Spicer, Republic Petroleum Co.; Lawrence Weill; Lloyd Williamson, California Star Oil Co., re-elected.

Newly elected officers of the Oil Producers Agency for 1940-41 shown above are: (Seated left to right) Maurice Machris, vice-president; L. L. Aubert, re-elected president; C. A. Johnson, vice-president; (Standing) W. A. Russell, secretary-treasurer; D. P. Murdy, assistant secretary-treasurer; Rush M. Blodget, executive vice-president. Also elected vice-presidents were L. A. Cranson and C. C. Spicer.

Nomads Hear Professor Dodge

At the regular monthly meeting of the Los Angeles Chapter of Nomads held on April 10, John Franklin Dodge, professor of Petroleum Engineering at the University of Southern California, gave a talk on the oil fields of India, Burma and the East Indies. Although conditions are probably changed since his visit to those countries, he presented information on the transportation routes and accessibility of the various areas together with general information relative to the importance of activities in the different fields. The dinner was preceded by a meeting of the various committees which gave detailed reports of their activities. After the dinner and preceding the main address of the evening new members were inducted into the organization.

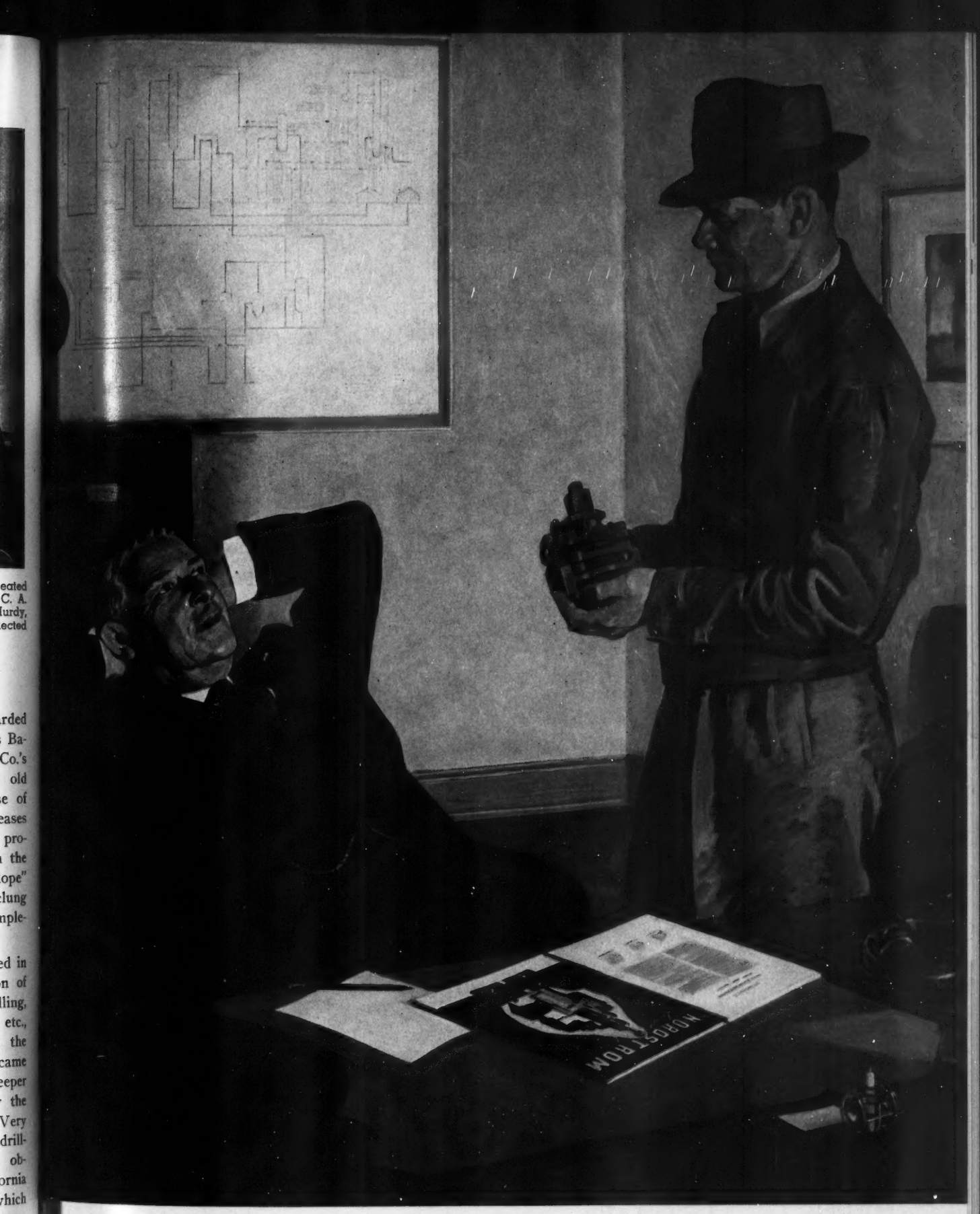
Over eighty members and their guests were in attendance and among those from foreign fields were the following: E. M. Archibald, Trinidad Petroleum Development Co.; F. W. Van Bilderbeek, B.P.M.; B. Bongers, U.B.O.T.; Erno Bonebakker, B.P.M.; Chas. D. Hauenstein, I.P.C. (Irac Pet. Co.); Karl B. Jauman, Attock Oil Co.; Clarence Ochs, Ecuadorian Oilfields, Ltd.; Jesse H. L. Scheppers, N.K.P.M.; John A. Thornton, B.P.M.; E. Le M. Trafford, B.P.M.

Data Released On Mystery Well

One of the most closely guarded of all wells in the Los Angeles Basin was West Whittier Oil Co.'s Pellissier No. 1 in the little old West Whittier field. Because of the availability of adjoining leases which might have been proved productive when the well was in the deep test stage, a strictly "no dope" policy was inaugurated and clung to until some weeks after completion.

As the first well to be drilled in the field since the introduction of controlled straight hole drilling, electric logging, core analysis, etc., much interest was shown in the project, especially when it became apparent that a new and deeper sand was being sought below the old Whitely zone at 3100 ft. Very little was known during the drilling except that information obtained and published by California Oil World News Service which since was proved to be correct.

Hole was drilled through hard,



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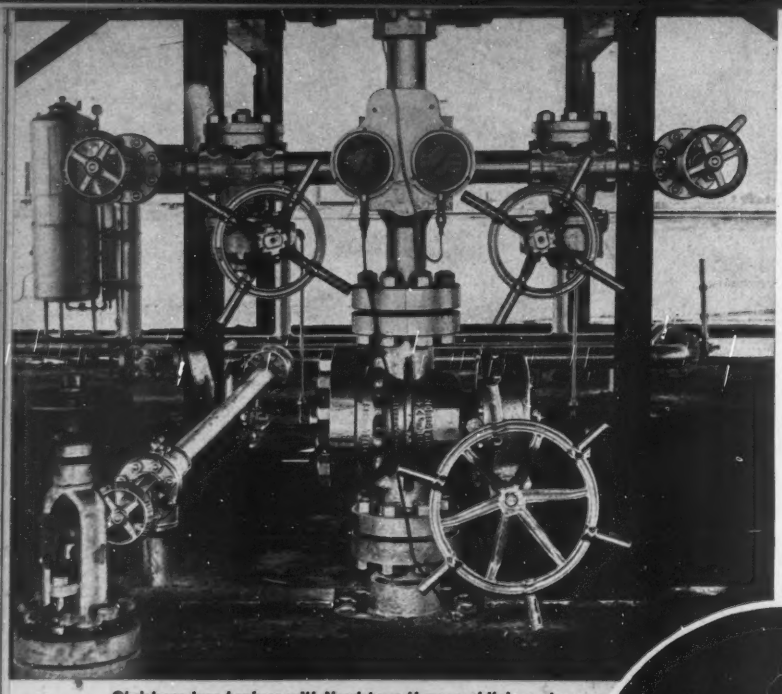
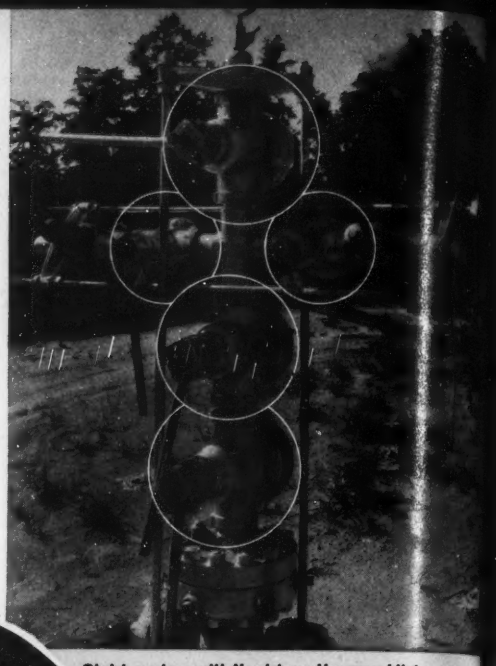


Christmas tree hook-up with Nordstrom Hypreseal Valves at Rio Bravo, California.



Christmas tree with Nordstrom Hypreseal Valves in Marion County, Texas.

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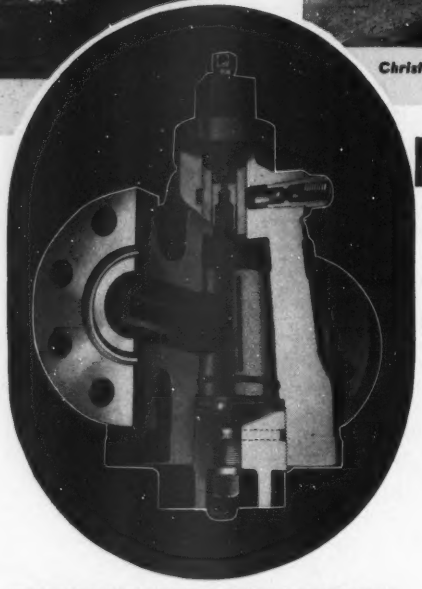

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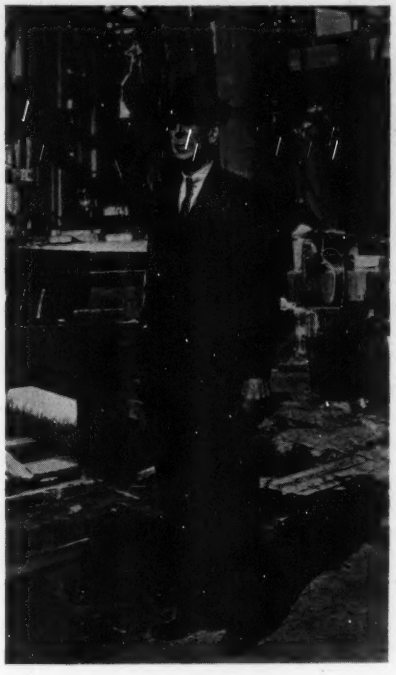
steeply dipping formations to 4400 ft. where the expected deep sand was found to be barren. Plugged to the upper horizon, mechanical trouble delayed operations for weeks, finally necessitating redrilling from 2960 ft. to 3158 ft. from which interval the well is now producing.

Although bothered by gas which is not quite sufficient to flow the well, but succeeds in effectually locking the pump, production capacity appears to be in the 100-bbl. class. The 24 gravity oil is nearly free of water, and may yet clean up entirely.

Wilmington Tops California Fields

Though definitely in the routine development stage without a single hot spot, Wilmington is yet the biggest thing in the California oil picture after three and one half years.

With a daily yield of 80,000 bbls., Wilmington leads Kettleman North Dome by 30,000 bbls. and, incidently averages only about 4000 bbls. a day over the Umpire's allowable



Kern Petroleum's president, R. E. Ibbetson, was snapped on Well No. 3, Long Beach.

while Kettleman's overage is about 17,000 bbls. a day.

In number of strings of tools actually working, Wilmington again leads the pack after losing out to Montebello for a few months; a condition which may repeat itself with the discovery of deeper sands in the latter field.

Not only in present activity, past activity and production does Wilmington take the Number 1 spot. It seriously threatens the world-wide records of Signal Hill for barrels recovered per acre and for total field recovery. Total recovery of the field to the end of 1939 was only about 80,000,000 bbls.; not at all sensational when compared with Santa Fe Spring's 79,781,000 bbls. for the year 1923 or even Signal Hill's top figure of 68,000,000 bbls. for the same year. It must be noted, however, that Santa Fe Springs dropped to slightly over 26,000,000 bbls. in 1924 and Signal Hill fell off to 60,-

(Continued on Page 76)

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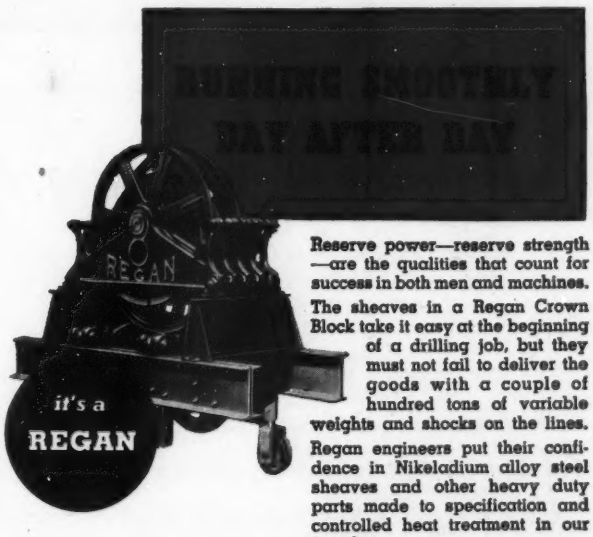

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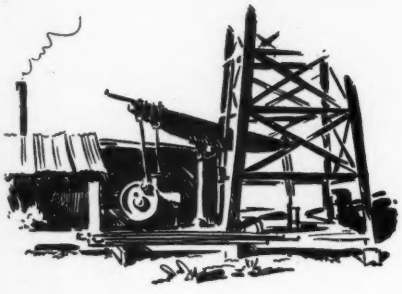

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Supervisor Training, An Executive Problem

How Leaders Are Developed

A. P. I. Pacific Coast Spring Meeting, 1940

By
H. H. Anderson
Vice President, Shell Oil Co., Inc.

Since its inception, production men with their many activities have been leaders in the American Petroleum Institute. During the '20's your pioneering of equipment standardization dominated the annual as well as mid-year meetings. During the '30's your Division of Production's technical programs have held equal prominence, and they have fostered an enthusiastic growth of district activities.

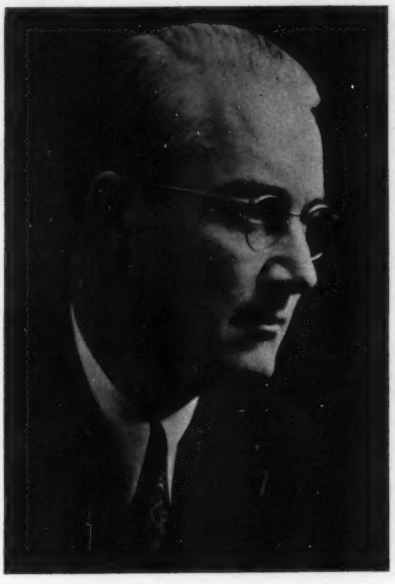
With unselfish cooperation, Institute members have developed drilling and production practices on a real scientific basis, making them outstanding examples of technological progress. You perhaps cannot claim greater achievement than your colleagues in refining, but you have met and solved more variable operating problems.

This rapid improvement of oil field practice has been led by technically-trained men who have been aided in step by the experience and judgment of non-technical executives, foremen and workers who for years have been a mainstay of the business. Each group has helped the other, and the public you serve has benefited by your joint effort. As always adequate production and those ever-mounting crude oil reserves give eloquent testimony of your achievement.

You have heard of the four M's of industry—money, material, men and management. You probably also have heard it stated that "ample money and the best of material are of limited value without men capable of working them and management trained to coordinate all effectively." However, because the men and management of the oil business have such a fine record of achievement, you may well ask why such a subject should be even mentioned before this gathering. My assignment today is to speak on that subject.

In 1920, in 1930, and in 1939, our nation suffered no shortage of crude oil, and none is in sight. Yet each of you continued every effort—individually and cooperatively—to improve the techniques of exploration, drilling, and production, so that you could feel yourselves well ahead of current demand and future reserve requirements. You were not satisfied to perpetuate the mysticism and rule-of-thumb methods prevalent in the oilfield practices of prior decades.

And in 1917, in 1919, in 1929, and again in 1933, you met great economic changes which affected all of your personnel, and imposed new demands on both men and management. A notable atmosphere of harmony has characterized your personnel relations. Yet the question has been recently asked—whether more emphasis has been given to the improvement of material, equipment, and operating techniques than to the improvement of men and the technique of their supervision.



H. H. Anderson

Many phases of this latter problem obviously have not been overlooked. You have combed the technical schools for young men likely to succeed in technical jobs. You have slowly but surely advanced the educational requirements of newly-hired field workers. You have in many cases established apprentice systems for training craftsmen. And you have encouraged attendance in vocational and night schools.

More recently your own Division of Production, through a hard-working committee cooperating with various State Departments of Trade and Industrial Training, has developed a comprehensive program for vocational training in oil and gas production. A group of about 15 basic, general and special courses are now available to any employee who will make the required effort for self-improvement. The cost per student is nominal, and some employers are aiding their men to take advantage of this splendid opportunity.

However, it is the subject of **supervisor training** that I wish to emphasize—the training of your subordinate management staff in the technique of leadership. So many good craftsmen have been promoted to foremen who have been expected to acquire—with but limited special guidance—those qualities of tact, self-control, initiative, teaching ability and judgment, which are necessary for effective supervision.

Everyone recognizes from your achievements that your men have been well supervised. However, it is equally sound policy to strive for continued improvement in supervisory technique the same as you are always striving to improve drilling and production practices. Man-hour productivity is largely dependent upon good leadership, and it is quite possible in certain instances today that improvement in leadership will accomplish more than improvement in operating methods.

Today we look to the supervisor not only for maximum productivity but also for the building and maintenance of good will among employees. His historic duties of work direction have been amplified by newer responsibilities to reflect and interpret management to his men and their reactions back to management. The leadership of men in industry today calls for understanding of man as an individual, of human relationships in society, and of the form of business enterprise which operates under the principles of American democracy.

It is said that the two most important requirements of a successful supervisor are: That he establish and maintain good relations with his men, his associate supervisors, and his bosses; and that he understand and know how to interpret company policies and the reasons for orders. Both of these are in addition to the requirement that he know the technique of the operations which his men perform.

Obviously the supervisor must know the technique of these vocational operations. In special cases these need not be known in detail, but he must be able to recognize quantity and quality in results, and to counsel in ways and means of improving them. Most supervisors were promoted after having performed the work themselves, in which cases the requisite craft knowledge has been obtained.

The supervisor should know also how to obtain maximum productivity. Here his teaching ability, tact, and initiative must be exercised. He must be an inspirational leader and a member of the team. A supervisor who understands the technique of leadership can do more than anything else to reduce the fatigue

Do you know?

— that as long as a palm tree is living it never stops growing?

— and that as long as WILSON Streamline Power Drilling and Production Equipment is being made, WILSON Engineers never stop improving on it?

— that a healthy palm is one of the most graceful plants in nature and that it inspires the respect and liking of all races?

— and that the new WILSON Streamline Drilling Rigs and Production Hoists are the most pleasing in appearance and have the respect and liking of drilling crews and all oil men who know their operation?

— that the date palm is the most productive plant in nature for the desolate places it thrives in, producing as much as 365 lbs. of dates per year?

— and that the WILSON Drilling Rig is the most productive hole maker, for the lowest operating cost in any location, but particularly in out-of-the-way places where fuel and water are scarce and expensive — that the large "Titan" model (12,000 foot rating with 4-inch drill pipe) has run at an average cost of $6.00, and less, per day with natural gas at 12c per m. c. f.?

— that due to the palms' long tap root it can grow where there is apparently little or no water — that this tap root reaches down to deep underground streams?

— and the WILSON Streamline Rig needs no water for its operation, except a small amount in a closed cooling system? Also that a steam rig uses two-thirds (⅔) to three-fourths (¾) of all the water needed to drill the average well, for steam generation *only*?

— that a palm can be cut or girdled to the extent that other trees would die, but that it lives on regardless?

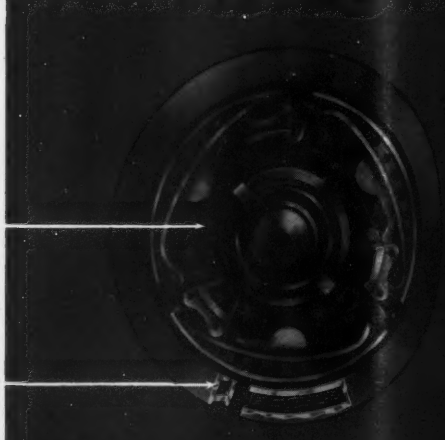
— and that a WILSON Drilling Rig, should one engine stop, will continue to operate to drive the pump, table and hoisting drum?

DO YOU KNOW that there are many New Model WILSON RIGS operating in California? If you don't know where these Rigs are running, write or phone us for particulars.

Wilson DRILLING & PRODUCTION RIG

GREATEST ECONOMY
EASIEST OPERATION
FASTEST CONTROL
FOOL-PROOF OPERATION
FASTEST ROUND-TRIPS
SMOOTHEST ACTION

The WILSON Built-In Drum Friction Clutch (shown at right) with the water cooling system, in a "Titan" Rig has a torque capacity 5½ times as great as the largest clutch made by any other American manufacturer. It is the outstanding reason for the WILSON Rig's extreme smoothness and flexibility. As can be seen, the outside rim is very thick and contains the water course for proper cooling of both the friction clutch *inside* and the brakes *outside* this rim. (Lower arrow points to this feature which keeps both brake and clutch cool and effectively prevents the heating of clutch surface which causes the ordinary clutch to stick and get out of adjustment.) Upper arrow points to One Point Adjustment feature made possible by small chain running over sprockets with end wrench squares. Wherever the drum might stop, an end wrench may be inserted and an adjustment made which automatically takes care of all three clutch shoes at once.



Hand B SALES COMPANY, LTD

2875 CHERRY AVE., LONG BEACH, CALIFORNIA, LONG BEACH 41

of his men, to improve their mental attitude toward their work, and to increase their rate of production.

The supervisor should know also how to interpret and apply employment policies, how to explain and sell new policies, and how to develop and train his men for advancement, giving attention to their promotion, transfer, et cetera.

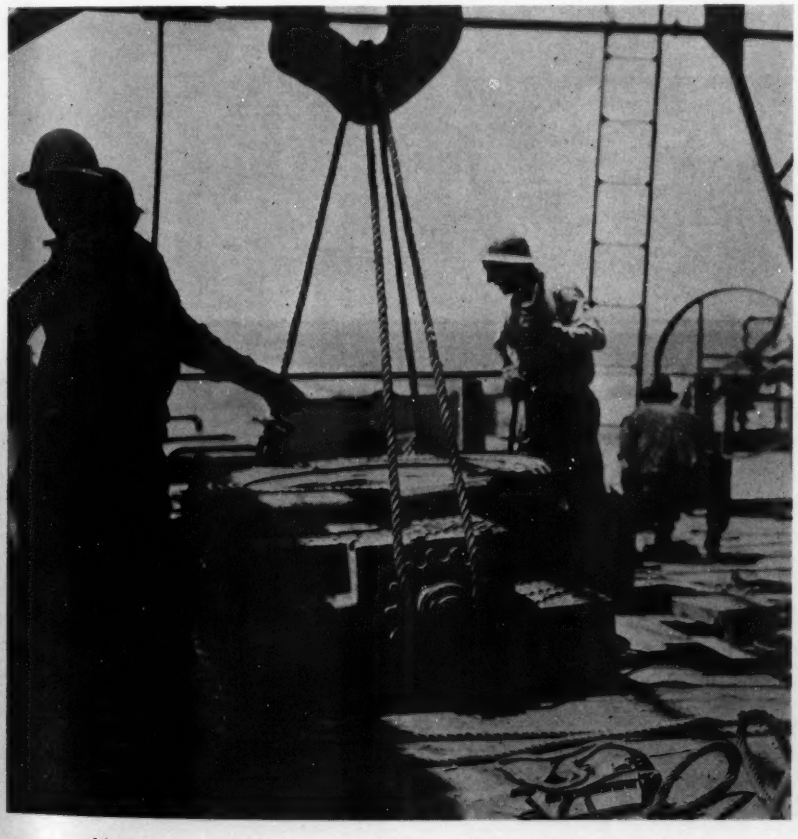
The supervisor should know also how to create in the minds of his men a sympathetic understanding of the objectives, functions, and economics of the company and the industry. Every employe must be "sold" on his own company before he will be able to sell it to anyone else, and he must be favorably inclined before he will do his part as an "ambassador of good-will" in contacting customers, neighbors, and friends.

To clarify our thinking, let us use the word "supervisor" to include such persons as farm bosses, foremen, section heads, superintendents, and department managers who are directing the activities of other employes. These persons are not merely agents or representatives of management, **they are an essential part of management itself.** It is in recognition of this fact that executives today are becoming more conscious of the need for definite programs of supervisor training.

Many executives are realizing that supervision or "foremanship" is essentially a profession, and that it must be taught as such. They are also aware that technical men who understand its principles are the better equipped to win full cooperation from the operating foreman whom they contact. To be most effective, any program of supervisor training should include managers and department heads as well as first-line foremen or key men. Proper training in leadership also is just as essential for those who direct white-collar workers as it is for those in the shop, plant, and field.

Interest amongst oil men in supervisor training has grown so rapidly that committees from your own Division of Production and from the A.P.I.'s Committee on Public Relations have given it considerable study. The Production group have concerned themselves principally with leadership training as a means of improving employe morale and work effectiveness. They have prepared a brochure dealing with the subject and also a manual suitable for use under specified conditions. The Public Relations group have been interested in the supervisor's part to build good-will amongst employes as a special public, and to gain their cooperation in building good-will among the general public.

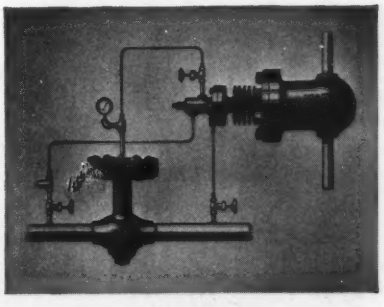
This brochure of the Division of Pro-



Making way for the casing spider on a Signal Hill deep exploit.

NEW N.G.E. BOILER FEED WATER REGULATOR

MAINTAINS CONSTANT LEVELS IN ALL TYPES OF BOILERS



Effects Instant Response to Fractional Level Changes

Without Friction– Surging– Leaking– Adjustment– This new N.G.E. feed water valve can be installed at any convenient point on the feed water line entering the boiler. It is not necessary to change the feed water piping on existing installations. Rise or fall of float actuates a small pilot valve, which in turn admits feed water pressure to a small diaphragm actuated valve on feed water line, and opens or closes in accordance with slight level changes. Float chamber is of cast steel for high working pressure; working parts are of corrosion-resistant stainless steel. Write for full details and specifications. Ask for New Bulletin

NATURAL GAS EQUIPMENT INCORPORATED

539 PETROLEUM BLDG., LOS ANGELES

BAKERSFIELD • HANFORD • SAN FRANCISCO • HOUSTON

NEW WHITES

every year for twenty-five years

"Lyman Stewart and W. L. Hardison have discovered oil (1886) near Santa Paula, but transportation costs appear prohibitive."

Thus reads the Union Oil Company's story of its "50 exciting years of service to the West."

"Transportation costs appear prohibitive!" How often those four words have stood in the path of progress! And with what ingenuity have American industrialists battered them down!

With White, this familiar phrase has come to be a welcome challenge, for wherever, otherwise, transportation costs would be prohibitive or difficult, White trucks show up at their best. In the lumber industry, in the mining industry, in the petroleum industry, and in every industry where hauling is a problem, major companies invariably move their products with the aid of Whites. Here are the reasons:

1. *Savings in Dead Weight.*
2. *Savings in Trip Time.*
3. *Savings in Fuel.*

These three qualities of White Super-Power Trucks, proved over and over again, cause leaders in business to turn invariably to White when replacement time comes.

Union Oil bought its first White Truck in 1915. And every single year for 25 years—the full last half of Union Oil history—the company has added to its impressive White fleet.

With Whites playing a prominent part in its great fleet, Union Oil solves its transportation problems, keeps abreast of transportation progress, and delivers excellent service to its public.

The White Motor Company is happy to have had its trucks so long and continuously an important factor in that service. Yes, it's . . .

a record that WHITE *is proud of, too*

THE WHITE MOTOR COMPANY. Branches in Los Angeles, San Francisco, Sacramento, Seattle, Portland and Spokane. Dealers in all the important cities.

duction describes a simple way (and in my opinion the best way) to accomplish this training. It describes a practical plan and facilities which are available to you. The plan has the hearty endorsement of all State Departments of Trade and Industrial Training, and they stand ready to give you their full cooperation. The services of these Departments are made available under the Smith-Hughes Act of 1917 and subsequent legislation.

The recommended plan uses the "conference method," which is the most successful and more universally accepted of the several methods developed to train supervisors. As distinguished from the informational meeting where information is given out, and the class where members are taught to do a job, the conference aims to organize group experience and to assist men to think through their problems and recognize basic principles.

Under a trained leader, the conference method assists a group of supervisors to pool their experiences, to compare their opinions, and to work out the group solution of common problems. The method is one of the best to promote interest in any subject, and is without equal to solve any problems within the experience of the group. It establishes principles, thus avoiding the necessity of solving the same problems continuously.

The plan of assembling supervisors at regular intervals has proved equally effective for use after the period of formal training, and as a method by which managers and superintendents can discuss current operating problems, plan new programs, and develop and disseminate new policies. It provides a permanent forum for the continuous training of supervisors, and the maintenance of continued attention to the problems of leadership.

Those who have studied the subject are convinced that only a carefully selected and applied technique of training will produce effective results, and most educators and many companies are of the somewhat common opinion that the conference method is best. During last February two groups of men selected from a number of Gulf Coast and Mid-Continent oil companies were trained as "conference leaders" in classes conducted by a specialist under the auspices of the Division of Production.

In answer to a recent questionnaire sent by Purdue University to twenty-two representative companies in diversified industries, some interesting replies were obtained. Such companies as American Steel and Wire, Armour, Chrysler, Corn Products, Eastman Kodak, B. F. Goodrich, and National Cash Register were on the list.

Twenty of the twenty-two companies have programs, seventeen of which are quite broad in coverage, and an equal number of which are handled by the companies themselves. The conference method was used in thirteen programs, and exclusively so in eight of them. Twelve of the programs have been in operation from 3½ to 19 years.

Out of sixteen answers to one question, fifteen said the program was successful and eight said it was "very" successful. Apparently all of the sixteen consider their programs are "permanent." One executive wrote—"I think that the fact that the program was carried on entirely through the depression period, and that the organization is now being used for dissemination of current changes or introduction of new procedures, is sufficient proof that management feels the purpose of the program has been achieved."

In conclusion, therefore, I may say that the adoption of a program of supervisor training, similar to those now successfully used by many companies, both within and without our industry, should result in a four-fold benefit:

1. To the workers it brings satisfaction with the manners and fairness of their boss and the atmosphere of their work surroundings;
2. To the supervisor it brings self-assurance and pride in his preferred position as a leader and his ability to properly discharge his many responsibilities;
3. To company management it should insure the intelligent carrying out of its policies and objectives, and the development of a productive, loyal working force through which public good-will is achieved;
4. To the industry, through betterment of internal relations, it assures a wholesome improvement in acceptance by the public.

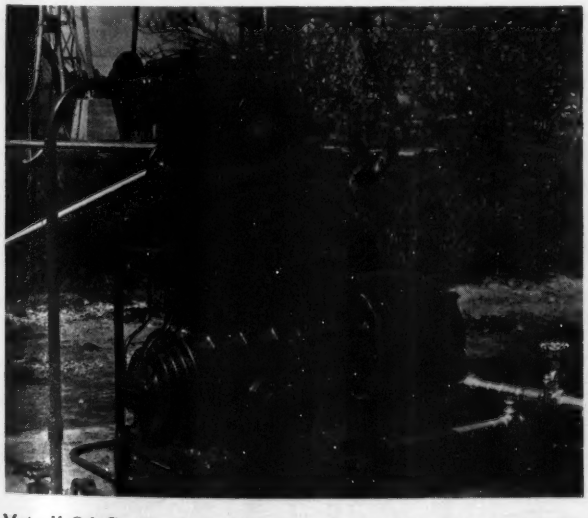
A program in which everyone benefits deserves a trial.

Here and There

Jack Shillinger, G. P.'s new right of way man, is building a new home in southwesterly Los Angeles, new job, new house and a far from old wife, what next Jack?

A California Oil World staff man reports what appeared to be a whirlwind in the vicinity of Rosecrans. Turned out later to be *Bob Wells,* gathering morning data and checking on wells engineered by Graser & Wells of Long Beach.

Rocky and *Mrs. Jerman* were seen busily putting away delicious barbecued ribs at one of the currently popular beach spots.



Metcalf Oil Co. No. 1, at Rosecrans, left, utilizes latest type of hydraulic lift equipment. At right, Kern Petroleum Corp. prepares to run the Nelson pre-gravel-packed liner seen in the foreground at the corporation's No. 3 in the Long Beach Pepper Drive area.

40,000 FEET OF RACKING SERVICE

... NOT A CENT FOR REPAIR

Here you see the first BAASH-ROSS Type 2RS Roller Kelly Drive Bushing, delivered a year ago. When inspected the other day it had completed more than 40,000 feet of hard service—with only regular greasing as maintenance, and NOT A CENT FOR REPAIR. The original parts are still good for many thousands of feet of additional service—and when the time for reconditioning does come, the cost will represent a very small fraction of a cent for each foot of hole drilled.

IMPORTANT IMPROVEMENTS— HEAVY CONSTRUCTION

The dozens of other BAASH-ROSS Type 2RS Roller Kelly Drive Bushings we have delivered in the past year are giving the same kind of economical service. The reason for their success is in their design. They have packed into them all of the good qualities that BAASH-ROSS have developed in roller kelly drive bushings through years of experience in building them, PLUS the new features, improvements, and far heavier construction necessary for lowest-cost, long service under high speed, heavy torque-load deep drilling with modern "super" rigs.

IT WILL PAY YOU TO CHANGE TO THE NEW

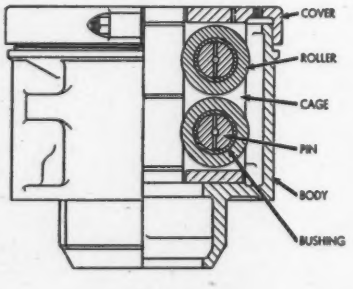
BAASH-ROSS Type 2RS ROLLER KELLY DRIVE BUSHING

WHY NOT WRITE FOR FULL INFORMATION, TODAY?

BUILT FOR MODERN HIGH SPEED HEAVY-TORQUE DRILLING

Here are the highlights on the BAASH-ROSS Type 2RS Roller Kelly Drive Bushing:

• Extra large diameter rollers (two in each cage) distribute the torque to the kelly, protecting its driving surfaces through reduced unit pressure. The rollers are made very hard to resist wear on their O. D. • High-hardness replaceable roller bushings eliminate wear on the I.D. of the rollers • Oversize reversible hardened-and-ground roller pins give double service life and eliminate pin breakage. • Adequate lubrication insured by individual grease ducts to the moving surfaces of each roller assembly.



SEND FOR ILLUSTRATED BULLETIN

or refer to pages 165 to 167 of your 1940 Composite Catalog for engineering details and complete description of the BAASH-ROSS Type 2RS Roller Kelly Drive Bushing.

BAASH ROSS

TOOL COMPANY

OIL WELL TOOLS · SPECIALTIES

LOS ANGELES

HOUSTON · NEW YORK

Ingenious "Gadgets" at C.N.G.A. Exhibition

Cover Wide Range of Subjects

The regular monthly meeting of California Natural Gasoline Association held Mar. 7 featured a display of "Gadgets" by members connected with various gasoline and oil companies. These devices were for the most part, developed by the men who presented them and showed a high degree of ingenuity and mechanical skill. The use of some of them unquestionably effected substantial savings in time and labor. Others of them were designed primarily in the interests of safety.

Following is a brief description of each "gadget" and what it is supposed to do, together with the name of the party presenting it and his company connection:

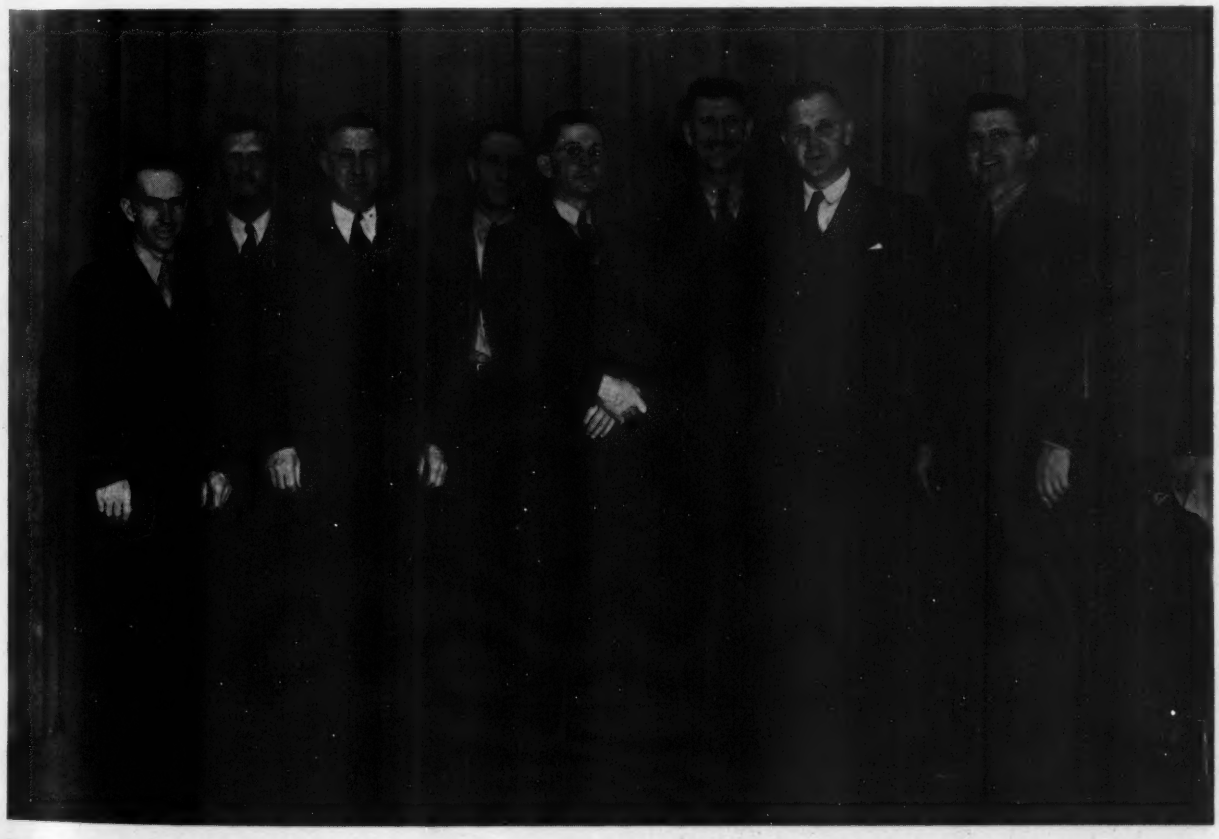
Chet Beard, gas engineer, for C.C.M.O. Co., Fellows, Calif. Chet is also the secretary of the Taft Chapter of C.N.G.A. He presented a Fuel Valve Cut Off for Union Tool Engines. The old Union Tool pumping engines on wells have hit and miss governors and on the "miss" strokes, draw in a charge of fuel which is wasted. This gadget consists of a gate valve in the fuel line with the threads removed from the stem and hooked up to the "hit and miss" mechanism so that the valve is closed on the "miss" cycle, thus saving this fuel. Savings of as high as 40% in pumping engine fuel are reported.

Jack Lough, machine shop foreman, southern California Gas Co. Mr. Lough presented three gadgets. First was a jig for babbiting the bearing surface of the Cooper Engine valve lifting mechanism. The jig has two half spherical parts with raised ridges welded on to give the oil grooves in the finished bearing. The jig is fixed in place in the lifter arm and the babbit is poured around it in the two ends. The advantage of the "gadget" is that no machining is necessary, bearing surfaces are correctly located and even the oil grooves are in the cast bearing.

The second was a pair of instruments used for lining up cylinders in tandem engines. They consisted of clamps and pulleys for suspending the piano wire used for establishing the center of the cylinder. The clamp also had vertical and horizontal screw adjustments for fine adjustments of the center line.

Mr. Lough's third exhibit was a tool for backing out broken studs. It consisted of a long heavy piece of hexagon shaped metal. In one end there was a hole to take the short broken shank of the stud. This hole was fitted with hardened pipe wrench jaws set so that as the whole tool turned the jaws grab the stud and back it out. When questioned as to what he did when the stud broke off flush, Mr. Lough said he still "drilled 'em out."

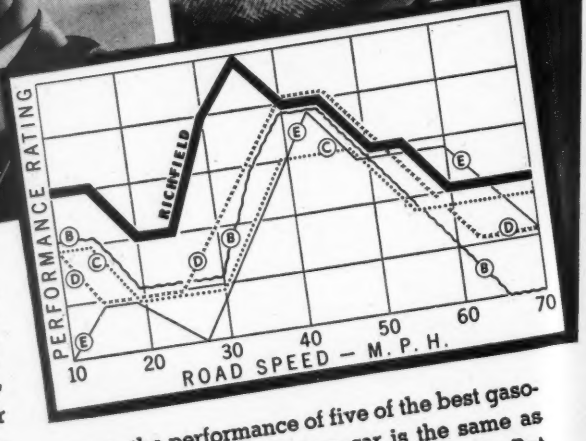
H. E. Wood, salesman for Paramount Mfg. Co. Mr. Wood's gadget was a pair of slide rules of his own make, for use in computing the properties of springs. The conventional method of computing springs is by tables and is a laborious cut and try proposition. With the slide rules, the spring requirements such as length, diameter, travel, etc. are set on one rule and the size spring wire and number of turns is read off. From the other rule the stress in the spring metal can be determined. The rules have been found



Participants in the CNGA March Meeting program in Los Angeles sponsored by the Association's Taft Chapter. Reading left to right: I. McMurray, Chas. V. Baxter, Clyde Peters, Jack Lough, A. R. Tinnin, F. F. Latta, R. N. Donaldson, chairman, Taft Chapter and Chet Beard, secretary, Taft Chapter.

"Go Places WITH RICHFIELD Says TYRONE POWER

"JOHNNY APOLLO"
20th Century-Fox's current production



WE received an invitation to prove to Tyrone Power that Richfield would completely out-perform any gasoline he could choose. So Larry Grunder (left), Richfield's automotive engineer, made the tests in a 1939 Ford V-8 Mr. Power usually drives to the studio. Tests were made on five top gasolines for performance and mileage.

This is the performance of five of the best gasolines you can buy. If your car is the same as Tyrone Power's, it will perform identically. But no matter what make of car you drive, we can prove that no other gasoline can match the performance of Richfield.

RICHFIELD—"GASOLINE OF THE STARS"

very useful in computing springs for regulations.

Charles V. Baxter, gasoline plant supervisor, Standard Oil Co. at Greeley Field. Mr. Baxter was confronted with a water tank kidney type level control which did not have power enough to operate the balanced valve in the filling line. He took off the balanced valve top and installed a diaphragm and made up a pilot control operated by the lever arm from the kidney float cage. The pilot was of the conventional leak off type, but was unique in that it was entirely made up of pipe fittings, barrel loops and material found around any plant.

He also had a similar pilot operated by a small float which rode directly in the water in the tank.

Clyde Peters, superintendent in charge of gas and gasoline operations, Belridge Oil Co., Belridge Field. Mr. Peters' gadget was a tool for cutting off tubes in open tubular cooling sections. When a leaky tube in the middle of the bundle is to be removed it is difficult to cut it off from the outside due to the closeness of adjoining tubes. This tool is a ½" rod with a hinged concealed cutter near the end. The rod is inserted in the tube and given a quick turn which engages the cutter. Then a couple of turns cuts off the tube. After the tube is cut off the rolled-in end is driven out and the new tube inserted and rolled in.

A. R. Tinnin, mechanic forman, Natural Gasoline Dept., Standard Oil Co., Kettleman Hills. Mr. Tinnin presented several gadgets coming out of his experience in Kettleman Hills:

1. A hot tap machine for tapping lines under pressure up to 2-inch size. The machine uses a flat boring cutter which will pass through the plug in a Nordstrum valve. The feed mechanism consists of a pair of screws from the elevators of orifice fittings and turned together by means of a bicycle sprocket and chain.

The principal advantages of this tool over the commercial type is the speed of making taps and the small space required, which is often important in tapping plant piping or where holes must be dug.

2. Metallic packing assembler. Anyone who has tried to assemble the several pieces of a section of metallic rod packing knows how hard it is to get the segments in place and then slip the holding spring in place without losing the whole assembly. This gadget allows the assembly of the segments around a dome shaped center piece of the proper diameter. The spring is then expanded over the dome and slips right over the segments and into the groove without displacing any of the several pieces.

3. Device for plugging condenser tubes under pressure. When tubular condensers are shut down to repair leaks it is often found that, due to temperature changes, several new leaks appear when the condenser is again put in service. This gadget is designed to plug off tubes in water tube condensers having a floating head. The water head is removed and the leaky tube is located. A short piece of round rod is slipped into the leaky tube. The rod is pointed and of such a length that when pushed clear into the floating head the point is just opposite the far tube sheet. A lead slug about 2" long with a recess fitting the pointed rod is then shoved in and hammered in around the pointed pin, thus sealing off the far end of the tube. The other end of the tube is then plugged with a tapered pin or pit hole plug, and the condenser is again ready for service without having been cooled down.

4. Compressor valve holder.—This is a simple ring of proper size to fit compressor plate valves and allow them to be put in a vise for cleaning, without distortion or marring.

5. Engine ring clips—These clips are cup shaped to fit the end of the piston ring and are provided with rings through which the fingers are slipped. One of the clips is placed on each end of large engine piston rings and it becomes an easy matter to expand the ring over the piston and slip it into the ring groove.

6. Valve grinding holding tool—In grinding valves on large engines it is often difficult to hold the grinder always at the proper angle so that the tool will stay in the holes provided in the top of the valve. This tool is nothing but a suction cup off of an automobile luggage carrier. The shank end of the cup is fastened to a crank. The suction cup is simply pressed down on the valve head and the valve can be turned by the crank. The angle at which the crank is held is not critical as the rubber shank of the cup is flexible and can take nearly any position.

7. Pump liner ripper—Removal of pump liners is sometimes a tough job with the regular liner puller, and chiseling out a liner is hard to do without injuring the cylinders of the pump. This liner ripper is a bar, ground on the end to provide a ripping cutter about ¼" wide. The cut is made by hammering the ripper. The trick in design of the tool is in the clearance given to the cutter, so that it will cut into the liner when struck but will not gouge through and injure the cylinder of the pump. A pump liner can be removed in a few minutes with this tool.

F. F. Latta of Kern County High School at Shafter, an authority on San Joaquin Valley history, gave an interesting talk on the early history of oil in California, going back to the time when Indians were first known to have used oil and asphalt. His talk described the early prospecting and drilling development on the "West Side" from Coalinga south to what is now known as Maricopa. Mr. Latta quoted dates and sources of information which showed the thoroughness with which he has covered the subject and, as he says, "My history of oil in the Valley ends with the year 1890".

The program ended with the showing by I. McMurray of the Southern California Gas Company at Taft, of some very fine color motion pictures of wild flowers in the San Joaquin Valley.

This program was sponsored by the Taft Chapter of C.N.G.A. as its part of an "exchange program" arrangement which is intended to be made an annual affair.

Tide Water Associated To Install Houdry Unit

Tide Water Associated Oil Co. announced that it has taken a license from the Houdry Process Corporation for 15,000 bbls. capacity per day of catalytic refining capacity. In connection with the taking of this license Tide Water Associated Oil Co. has awarded a contract to E. B. Badger & Sons Company for the design and construction of the unit which will be located at the Company's refinery at Bayonne, New Jersey, and will replace older facilities.

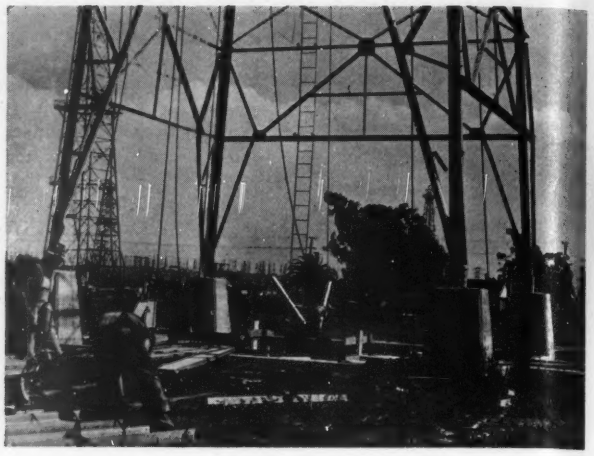
The installation of this unit, employing the latest scientific development in the manufacture of high quality gasoline, is being made in conformity with Tide Water Associated's policy of adopting the most modern refining methods for the manufacture of its well-known line of Tydol gasolines and heating oils in the Eastern territories.

The Company has also recently installed at its refinery in Avon, California, additional cracking facilities and a polymerization plant for the production of a gasoline of high anti-knock value and improving its straight run gasoline, and at present has in the course of construction an alkylation plant at its Avon Refinery for the purpose of making higher octane gasoline of aviation specifications at lower cost, thus further improving the quality of its Associated gasolines and heating oils marketed on the Pacific Coast.

The new unit at the Company's Bayonne Refinery should be completed and in operation toward the latter part of this year.

Here and There

Though he may not yet know it, Superintendent *Bill Hendricks* of Hollywood Oil Co. is a swell prospect for motor boat salesmen, judging from current enthusiasm of the Missus.



Left, Commerce and Industry graphically shown in the Long Beach Harbor section of the Wilmington oil field. Right, In the far background of this Rosecrans action shot may be seen the derricks of Dominguez.

(Continued from Page 65)

000,000 bbls. Wilmington, on the other hand, in the face of a larger potential due to many good completions, curtailed its yield from 34,-168,000 bbls. in 1938 to 31,100,000 bbls. in 1939, during which, in the course of normal development, production would have been much higher.

Because of the enforced slow recovery rate and in some cases because of difficulty in disposing of the oil, both development of the field and the pay-out of the wells has been slower than its notable predecessors. Offsetting this, strict supervision by the State Corporation Commissioner eliminated the wild promotion schemes which characterizes the mad development of the 1920's and allowed only those to drill who really wanted to find oil for their investors. Consequently, the field proper is yet without a dry hole.

Largest fee property holder is Union Pacific Railroad, whose predecessor, Los Angeles & Salt Lake Railroad, held large acreage in the center of the most productive area. Next in holdings is the City of Long Beach whose development work is being done by Long Beach Oil Development Co. and whose properties are nearly all very favorably located. General Petroleum Corp., discoverer of Wilmington proper, has extensive acreage, while Royalty Service Corp. leads the independents.

With undeveloped Terminal zone properties remaining only in the hands of the largest operators, most of the activity is now in Ranger zone territory in the northerly section of Long Beach Harbor and in the northwest portion of the Wilmington townlot area where prolific low gravity wells are obtained. In the former district, Morton & Elder produced Harbor No. 1, northeast corner of Wilmington Blvd. and Ellis, at the rate of 400 bbls. per day by swabbing between heads. In the Wilmington northwest area, Franco-American Oil Co. No. 2 came in at the rate of 200 bbls. a day, flowing, from a total depth of 3641 ft. Like all other Ranger zone wells, these were finished with the pre-gravel-packed type of perforated liner developed only a year ago by J. B. Nelson.

A Wonderly construction crew runs steel for Rainbow Drilling Co. at Rosecrans.

Here and There

Lynn Sault, draftsman for Homer Dulin enterprises, good as he is on the table, should have been a merchant. You should see the deal he offered when approached by a new car salesman. (Lynn won't know if he bought a new car until the salesman recovers consciousness.)

Received the other day the following postal:

Believe it or not, your old Peruvian friend is here making goo-goo eyes at the Senoritas. This is a wonderful country, but oh what gasoline! Have been here two weeks taking in ALL points of interest. Swell place to see on a vacation. Wonderful opportunities for new business. With $5.00 per day you can live like a king. I'm stuck on this country. Regards, *Louis C. Chappuis.*

Always thought we'd like it there too, but not having majored in Geology, we don't seem to get around. You might at least have added "wish you were here", *Louis.*

Field Development

San Joaquin Valley

Western Gulf Prepares To Complete Paloma Well

Apparently convinced that, after 11,216 ft. of drilling, the oil resources of the Stevens zone at Paloma have been exhausted, Western Gulf Oil Co. is preparing to test fingers below the main oil zone before plugging to the base of the good oil sand at 10,353 ft.

Located at the easterly edge of its discovery sec. 3,32-26, Western Gulf's second Paloma well, KCL No. A-74-3 marked the first oil sand at 10,083 ft. Top of the main body was entered at 10,134 ft. and carried to 10,353 ft. where the drill encountered silty shale. A 23-ft. interval of oil sand was found below 10,596 ft. and a few light fingers at 11,093 ft. At present the well is plugged to 10,700 ft. for tests of the basal Stevens. While it is not probable that the lower showings are productive enough to be taken in the final completion, good practice demands that they be tried before they are plugged off.

Ohio Oil Co., long within striking distance of Paloma completion, is still delayed by a stubborn fishing job. Located just north of the original well in section 3, Ohio's KCL No. B-2-43-3 entered the main oil sand at 10,085 ft. in early March only to lose drill pipe in the hole. The pipe to date has been recovered from 6139 ft.

Richfield Developing Cole's Levee Reserves

With refining and marketing demands increasing, Richfield Oil Corp. is busy developing the Cole's Levee district. Eleven strings, operated under contract by Bell and Loffland, J. E. Mabee, Thos. Pike and Taft Well Drilling Co., are now working and rigs are built for four more.

Also operating in the area with one string each are, Standard Oil Co., Union Oil Co. and Ohio Oil Co.

Producing high gravity oil from wells establishing high potentials and operated in accordance with the best practices of controlled development, Cole's Levee in one year and a half has become one of the most valuable fields in the state.

Situated on the flat lands southwest of Bakersfield on the road to Taft, the area offers no geographical disadvantages and is readily accessible to previously established refining and pipeline facilities.

SAN JOAQUIN VALLEY WILDCATS

Area	Well	No.	Section	Depth	Status
Fresno County					
Cantua Creek	Logan, J. E., L & Y	1	26, 16-14		Rigging up
	The Texas Co., S.P.	1	23, 17-15	10098	Drilling
Coalinga	Lewis, C. H.	1	18, 21-15	1025	Drilling
	Section Thirty Oil Co.	7	30, 19-15	565	Drilling
	Shell Oil Co.	45-2	2, 20-15		Rigging up
	Tide Water Assoc. Oil, Guardian	22	2, 20-15	3612	Shut in.
Gatos Creek	Gatos Creek Oil Co.	1	19, 19-13	466	Idle
Huron	The Texas Co., Boston	1	14, 20-18	10747	Abandoned
Kingsburg	Erickson & Swanson	2	22, 16-22	360	Drilling
Mendota	Jergins Oil Co., Cheney Ranch	1	29, 14-13	8155	Drilling
Kern County					
Arvin	Morton, Lindley C., Jewett	1	23, 31-29	5798	Drilling
Belridge—South	Santa Mora Oil Co.	1	10, 28-20		Material
	Union Oil Co., Fitzgerald-Weston	1	13, 29-21	6720	Drilling
Buena Vista	Gen. Pet. Corp., B.V.A.	1	1, 32-24	11886	Idle
	Shell Oil Co., B.V.A.	45-9	9, 32-25	11575	Drilling
Comanche Point	Oil Scout, Inc.	1	27, 32-29	5508	Idle
Devil's Den	Trigg, H. C.	1	11, 25-18	492	Fish casing
Edison	Goodrum & Vincent, Inc., S.P.	3	31, 29-30	803	Idle
	Goodrum & Vincent, Inc., S.P.	4	31, 29-30	513	Bailing
Grapevine	Richfield Oil Corp., Tejon Ranch	1	2, 10-19	4265	Drilling
Jasmine	Premier Extension Oil Co.	1	33, 25-27	2935	Drilling
Kern Front	Davis Petroleum Co.	1	13, 28-27	1804	Pumping water
McKittrick	Burt & Taylor, Taylor	1	30, 30-22	1047	Idle
	Cal Crude Pet. Co.	5	34, 30-22	1395	Prep. to deepen
	Franco-Western Oil Co.	18	8, 30-22	2086	Rng. liner
	Franco-Western Oil Co.	19	8, 30-22		Rig
Mt. Poso	Hearte & Harkness	1	36, 26-27	3325	Abandoned
Round Mt.	Shell Oil Co., Brandt	1	33, 28-29	2320	Abandoned
Semitropic	Gen. Pet. Corp., K.P.C.	1	16, 26-22	733	Drilling
	North Kern Oil Co., Sawyer	1	16, 25-22		Rigging up
Shafter	Continental Oil Co., Comm.	1	12, 28-24	13028	Testing
Shale Hills	Scotia Exploration Co., Abbott	1	7, 27-19	2047	Idle
	The Texas Co., McD-Theta	1	12, 28-19	3395	Redrilling 2906
Wheeler Ridge	Richfield Oil Corp.	KCL 2	28, 11-20	323	Drilling
Kings County					
Kettleman—South Dome	Bristol Oil Co., Smith	1	35, 24-19	8054	Bailing
W. Tulare Lake	Shell Oil Co., Cohn Estate	6-4	4, 22-19	11640	Drilling

Fruitvale Deep Test Finds Eocene Barren

KCL No. B-45, drilled in the southwest quarter of sec. 22,29-27, the center of Western Gulf Oil Co.'s Fruitvale holdings, has apparently exhausted all possibilities of a new deep producing horizon in this field. Located adjacent to creditable shallow production, the well was carried to 10,152 ft. in medium coarse gray sand classified as Eocene. Continued drilling would bring the basement complex as evidenced by Meridian Petroleum's Fee No. 2, which drilled to basement in the adjoining section late last year.

Although apparently in separate fault blocks, since the barren Vedder was found nearly 1500 ft. lower in the current try than in the Meridian well, the findings correlate well enough to indicate that with the Eocene unfruitful further drilling is pointless.

Jergins Test Looks Worse

The mystery well being drilled by Jergins Oil Co. in sec. 29,14-13 near Mendota in Fresno county, according to latest advices seems to be looking worse. While exact formations are yet unrevealed, supposition places the estimated 8155-ft. bottom well into Cretaceous.

With all formations barren down to meager showings supposedly in Upper Cretaceous near 6700 ft., and which formation tests appeared to discredit, deepening operations to an outside chance at Middle Cretaceous sands was the well's only hope. A sand body reported near 8100 ft. about which not even rumor has bragged, may be the objective sand horizon, but the odds-on bet now is that the story will be told with red ink.

Shell Starts Shallow Coalinga Off-Set Well

Prompted by the Tide Water Associated Oil Co.'s freak completion from shallow Temblor oil sands in the old East Coalinga field, Shell Oil Co. is rigging up to drill No. 45-2 near the northeast corner of sec. 2,20-15.

Situated near the Tide Water's Guardian No. 22, the well will be carried to the 3600 ft. mark from which an unaccustomedly large oil flow was marked by the Guardian well.

The Tide Water well, put on the beam for what was considered a purely routine completion in low pressure, depleted shallow sands, suddenly started flowing clean, 31 gravity oil at a 1400 barrel rate. The well was subsequently killed to permit removal of pumping equipment and the installation of a heavy flow hook-up.

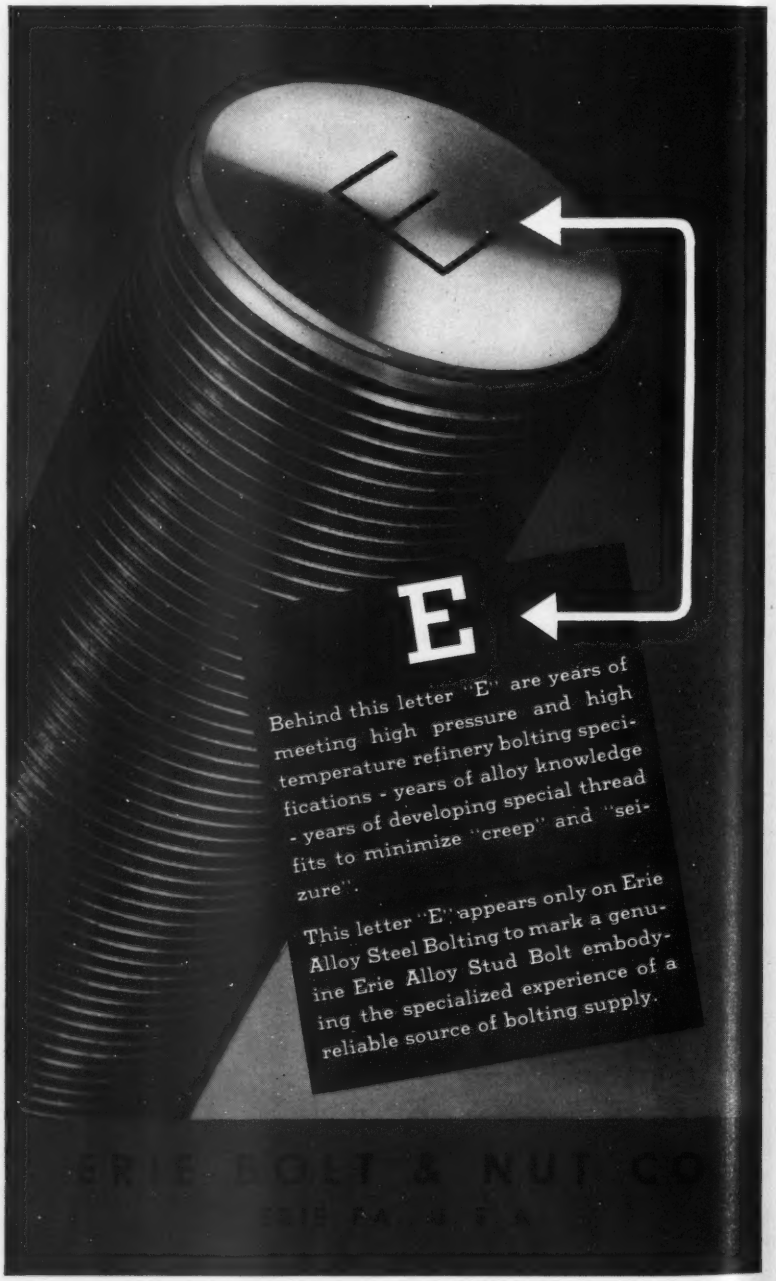
Other shallow development is being carried on by C. H. Lewis, who is drilling Well No. 1 at 1025 ft. in sec. 18,21-15; and by Section 30 Oil Co., which is drilling Well No. 7 at 565 ft. in sec. 30,19-15.

Shafter Area Wildcat Not Encouraging

First of the Valley deep tests to be drilled in an area where many smaller operators hold potentially productive leases, and consequently closely followed by independent oil men, Continental Oil Co. is making routine tests on Community No. 1.

Located near the northeast corner of sec. 12,28-24, on a southeasterly line drawn from the prolific Wasco field, the hole is the latest of many deep tests intended to produce from deep sands approximating the Wasco Vedder sands.

Drilled to 13,028 ft. after exhausting all probable shots at deep production, the hole has been bridged at 12,700 ft. for tests of the upper Vedder below 12,630 ft. Since nothing of importance was reported during the drilling of the zone, nor was anything said about the possibil-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ities of the Wasco A-2 sand equivalent, hard and gray at 12,416 ft., it is probable that the current tests presage an early abandonment.

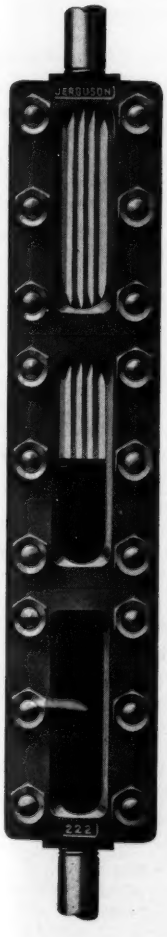
Gen. Pet. Spuds Semitropic Try

Located only a mile north of the old Richfield Oil Corp. Kerwin No. 1, which reported traces of high gravity oil during its 5210 ft. of drilling, General Petroleum Corp. is drilling K.P.C. No. 1 in the southwest quarter of sec. 16,26-22.

It seems possible that the progress made in drilling technique and formation analysis during the past decade may permit a successful operation in the area formerly considered a commercial failure.

Six miles north of the present driller, North Kern Oil Co. is putting finishing touches to a high speed rig and is momentarily expected to spud. This project is intended to thoroughly prospect to and including the Eocene, unless commercial oil or gas is encountered higher in the hole. Located in sec. 16,25-22, the project is backed by a group of well known California operators, of whom C. A. Doody is the nominal head.

JERGUSON



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Premier Extension Prepares to Core

White hope of the Jasmine area, Premier Extension Oil Co., drilling in sec. 35,25-27 at 2935 ft., is preparing to core for oil sands long suspected present in the area. Located southwest of the old Doyle Pet. Corp.'s Quinn No. 1, which was reported to have yielded some heavy oil, along with water, from the Walker sands during operations in 1938, the well is the latest of many to attempt production from either the heretofore unproducable Walker or the normal east Valley Vedder sands.

Standard Completes Good Greeley Well

Situated at the northwest flank of the main body of the Greeley field on a line toward the new Greeley extension, Standard Oil Co. completed KCL No. 11-23 flowing 3650 barrels of clean 34 gravity oil with 2,700,000 cu. ft. of gas through a 12/64 in. bean. Development between the Greeley field, exclusively held by Standard, and the prolific extension area, is being done by Standard, while in the newly proved area and adjacent lands General Petroleum Corp. and the Superior Oil Co. are the sole operators.

Texas Co. Gets Good Midway-Sunset Pumper

Completed on the beam in the southeast quarter of sec. 32,32-24, The Texas Co.'s well No. 39 yielded clean 23 gravity oil at a 288 barrel rate. This completion is from a small area in the old Midway-Sunset field where production figures are consistently higher than the field average.

In sec. 26,31-32, Joseph McDonald completed No. 19 for 57 barrels of 14 gravity oil and has spudded No. 20. National Oil Co. also obtained small production in sec. 35,32-23 with the completion of No. 36 for 30 barrels of 12.5 gravity oil from 1545 ft.

Robt. A. Foster is digging below 1380 ft. in sec. 15,32-23, while Signal Oil and Gas Co. is working Kendon Nos. 6 and 7 in sec. 35,32-23.

Texas Co. Hangs Up Huron Deep Try

After drilling through totally barren formations to 10,747 ft., and losing a 600 ft. drill pipe fish on bottom, The Texas Co. has abandoned Boston No. 1. Located in sec. 14,20-18, near the Fresno-Kings county line, the well was the first to explore the possibilities of the district below 3500 ft. The only other drilling within a radius of one mile was by Shell Oil Co., who drilled a core hole, Boston

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No. "F," to 1865 ft. during 1929, and Seaboard Oil Corp., which drilled Boston No. 1 to an arid 3500 ft. in 1935.

Hearte & Harkness Quit on Tracy No. 1

In sec. 36,26-27, two miles west of Mount Poso production, Hearte & Harkness abandoned Tracy No. 1 after bottoming in Walker sands at 3325 ft.

In the north portion of the field, Bishop Oil Co. has completed No. 2, in sec. 20,26-28, pumping 55 barrels of 14 gravity oil. The contract for drilling No. 3 has been let to Brown Drilling Co. of Long Beach. Vedder Petroleum Corp., Ltd. finished Lambert No. 21-2 in sec. 21,26-28 from Vedder sands at 1565 ft. for a 58 barrel yield of 14.7 gravity oil. The company is rigging up No. 31-2 in sec. 31,26-28. A. T. Yeager is drilling Murdoch No. 3 below 1100 ft. on sec. 34,27-28.

Shell Abandons Round Mt. Try

Drilled to barren Vedder at 2320 ft. with a portable unit furnished by Hall-Baker Co., Shell Oil Co.'s Round Mountain wildcat has been abandoned. Located in sec. 33,28-29, two miles southeast of the field, Brandt No. 1 attempted to find another of the small accumulations for which the east Valley is famed.

Shell Cores Gray Sand In West Tulare "Cat"

Up at the west edge of Tulare Lake bed, some six miles northeast of Kettleman North Dome, Shell Oil Co.'s Cohn Estate No. 6-4 has entered what appears to be gray Vaqueros sand, the main producing body in the Dome field.

Located in sec. 4,22-19, the well is the first deep test of the area; indeed the first try of any sort for years. Far removed as it is from accurate correlation points, the relative position in the geologic column is vague. With the McLure shales marked at 9830 ft., the well appears to be some 5000 ft. deeper than the Kettleman structure, in which case the gray sands found at 11,515 ft. would seem to exhaust the possibility of similar production in this try. Continued drilling from present bottom of 11,640 ft. through the 1000 feet of Kreyenhagen normally present in the central Valley, brings another shot at production in the Eocene age. Below that of course is the Cretaceous, productive in the State at but one small point in the shallow west side of the Valley, and offering but scant hope of commercial success elsewhere.

Morton "Cat" Fails on Formation Test

Drilling near the center of sec. 23,31-29, southeast of Arvin production, Lindley C. Morton's Jewett No. 1 was last reported in red and green clay at 5798 ft. A formation test of the interval 5460 to 5560 ft. produced only gassy, oily water.

Union Oil Drilling Belridge Extension

Drilling a mile and a half southeast of the tip of the South Belridge Field, Union Oil Co.'s Fitzgerald-Weston No. 1, in sec. 13,29-21, was last reported drilling below 6700 ft. The well is the latest of many to attempt an extension of this field, or to find another accumulation of the same general nature.

Santa Mora Oil Co., planning to drill on sec. 10,28-20, off the north tip of the field, has hauled in material but is not at present active.

Foreign Delegates To Tulsa Oil Show

Assurance of the largest international attendance in the history of the International Petroleum Exposition was had following the receipt of a cablegram by President W. G. Skelly stating that a Japanese delegation is enroute to Tulsa for the May 18 to 25 Tulsa oil show.

The Japanese notification brings to 19 the number of nations which have already promised delegates for the 1940 Exposition. This is already in excess of the 18 nations which sent representatives to the last show, held in 1938, and Exposition officials look for a total of 25 nations to attend the Exposition this year.

The three Japanese engineers, representing the Nippon Oil Co., Tokio, are Ryozo Niijima, Shigeru Yamanouchi, and Komao Tachikawa.

The list of 19 nations from which delegates have already been promised includes: Greece, Colombia, S.A., Trinidad, B.W.I., Venezuela, Turkey, Italy, Germany, Great Britain, Canada, Mexico, Roumania, Russia. France, Peru, Ecuador, Cuba, Argentina, Dominican Republic, and Japan.

Axelson Exhibit Certain to Attract

This year the booth of the Axelson Manufacturing Co. in the International Petroleum Exposition in Tulsa will be radically different from anything ever sponsored by this company in the past. Exhibits of Axelson products are being held to a minimum, but there will be another type of display which executives of the company feel will appeal even more to those attending the exposition.

LAUGH THIS OFF

There is no question about it—people would be a lot more honest if the fool and his money weren't so easily parted.

And when a woman does what an efficiency expert does it is usually called nagging.

Speaking of women, **Barney Barnwell** tells us that a Bakersfield lad went to call on his girl friend a few nights ago, but when he arrived at her home found a notice on the door reading, "Bell out of order," so he just went out to a stag party.

Then there was the rousty who went to Long Beach on his day off and tried to vamp the good looking lass who was sunning herself on the sands. "Why," she said indignantly, "I don't know you from Adam." "So what?" says he, "I wouldn't know you from Eve."

This may need some verification, but we are told on good authority nevertheless that **Mac McKinnon** the sage of Hovey Hills walked into a drug store in Taft a few days ago, and assailed the clerk as follows: "Are you a qualified pharmacists?" "Oh yes," was the reply. "And have you a diploma?" Mac continued. "Sure, there it is hanging on the wall," said the clerk. "Well, okay," says Mac, "You can gimme a package of Smith Brothers cough drops."

Mac is very careful about these things. Not long ago he developed a wee cough, and had to take a week off.

Clayton Hall now gives us a classic example of the oilman's ingenuity, in this stirring episode from Round Mountain: The foreman popped into the pump station, and after making the rounds, told the engineer he ought to do something about the front gate—it was sticking terribly. On his next trip he found a huge placard tacked to the gate. It read, "Push hard. This gate sticks."

Which recalls a bad tempered rousty we used to know at Del Rey—his girl gave him the gate, and boy, did he take offense.

This was the lad who, according to **Swede Larsen,** once went shopping with his wife. They were in the local millinery store and the little lady was having a swell time. "Do you like this one turned down?" she asked as she looked at him from beneath a snappy new model. "How much is it?" he continued, and she answered, "Twenty dollars." "Yeah," he says, "Turn it down."

By the way, while we were in the hospital recently we learned that a doctor was treating one of our best friends for indigestion, apparently unaware of the fact that the lad could quite well afford an appendectomy.

Also, **Dick Thinn** tells about the foreman who was asked, "Haven't you talked to the men about this?" "Naw," he replied, "Not yet. I'm gonna ask their advice after I've decided what to do."

Now, if you want to experience the thrill of sitting in one of these new streamline trains watching the countryside fly past, we suggest that you go out to Fox Hills or Baldwin Hills Golf Club on May 18 and sit at the first tee while Union Oil Company's annual golf tournament is under way.

Which prompts **Tom Taggart** to remark, "When you are addressing the ball be sure to put the right postage on it."

And **George Tyler** says, "When you see an oil man with powder marks on his coat, it doesn't mean that he has been shot at close range."

"I thought you said you could mend these shoes while I waited," said **Harry Lee** to the cobbler on the third day. "Well," said the hoofer calmly, "You're waitin' aren't you?"

And don't be disappointed if you can't get hep to this jitter bug dancing—maybe you're just too sound mentally.

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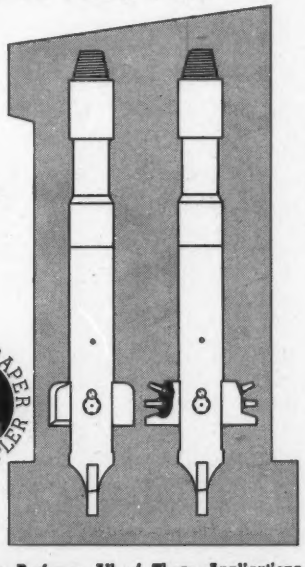

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Los Angeles Basin

8-3 Zone Discovery Stimulates Montebello

Discovery of the so-called 8-3 zone at Montebello has already resulted in considerably increased activity, chiefly the deepening of old wells with unfavorable oil allowables in the 7th and upper 8th zones.

Most sensational completion yet obtained in the new lower zone is Kern Oil Co.'s Monterey No. 38. Located just north of Lincoln Ave. at the intersection of Maple, the hole was deepened to 7789 ft. where a formation test with packer set at 7580 ft. obtained an eighteen hundred barrel rate of flow together with 1,500,000 cu. ft. of gas. With a perforated liner landed on bottom and tubing run to 7770 ft., packer set at 7550 ft. and adjustable sleeve at 7490 ft., the well was completed in all the Seventh and Eighth zone sands flowing 1450 bbls. a day of 35 gravity clean oil and 3,000,000 cu. ft. of gas through a 26/64 in. surface bean. Flow pressure was 500 lbs. while casing pressure registered 1000 lbs.

Monterey No. 38 is favorably located inside the 7100 ft. sub-sea contour at the top of the Eighth zone. That Eight zone third finger production extends at least to the 7150 ft. contour is indicated by Kern Oil's Monterey No. 34, which flowing from the interval 7665-7805 ft., produced 450 bbls. of 36 gravity oil and 785,000 cu. ft. of gas through a 22/64 in. bean.

Slightly lower structurally than the Kern wells, J. E. Mabee's Monterey Nos. 39 and 43 have encountered some water, tending to show that production in the new sand may not extend materially beyond the 7150 ft. Eighth zone contour. Much light will be shed on this point on completion of tests now being made by Mono Oil Co.'s Foreman No. 1 bottomed at 7882 ft.

Columbia Oil Co. is completing Crawford No. 19 in the 8-2 zone after tests revealed the deeper sands as being wet as in R. R. Bush Oil Co.'s Mihlfred No. 2.

Extremely interesting are developments in United Montebello Oil Co.'s No. 3 at the northwest corner of 6th St. and Beverly Blvd. which is deepening at 7880 ft. The log below the old 7650 ft. bottom has shown a surprising thickening of the 8-3 shale, the sand itself not having yet been encountered. Correlations place this well approximately 50 ft. higher than Union Oil Co.'s La Merced No. 30, only other deep test in the easterly section of the field.

On the apex of the structure, Montebello Reservoir Oil Co. is sidetracking the old liner preparatory to deepening Reservoir No. 2 below the old bottom at 7612 ft.

South and east of the intersection of Wilcox Ave. and Beverly Blvd., Grace Oil Co. brought in Lawrence-Duhrsen No. 1 flowing 275 bbls. a day of clean oil from 7620 ft.

El Rey Oil Co. Tests Athens-Potrero Wildcat

Most important project in the entire Los Angeles Basin is now El Rey Oil Co.'s Westmore No. 1, wildcat well located at the northwest corner of Imperial Highway and Western Ave. With 7 in. casing cemented at 8632 ft. and a perforated liner landed on plugged bottom at 9000 ft., tubing has been run and a swabbing test is being made of the streaks of oil sand which were estimated to comprise at least 30% of the formation open.

Drilled with financial assistance of major companies, the well topped Miocene at the unexpectedly low level of 8190 ft. but still found good cuts in the O'Dea zone equivalent sands, the first of which were encountered at 8440 ft. All sand streaks were, however, extremely tight and low in porosity and permeability; a circumstance leading to the belief of some engineers that a little oil will be recovered but the well will not be a commercial producer.

Total depth of the hole is 9063 ft. in shale and gray sand.

Newhall Wildcat Builds Steel Rig

Production tests of showings in British American Oil Producing Co.'s Edwina No. 1 near Newhall, sec. 11,3-16, were delayed when the wood derrick was unable to stand the strain of pulling 8⅝ in. casing which "froze" at 2500 ft. The pipe was removed by means of hydraulic jacks and a steel derrick is being built before reaming the hole to re-run. Being a strictly no dope well, it is unknown where the casing will be cemented. Total depth is estimated at 4650 ft.

Turf Club Well Deepens Below 6800

Turf Oil Co. is deepening Turf Club No. 1 below 6800 ft. after unsatisfactory tests with 8⅝ in. casing cemented at

LOS ANGELES BASIN WILDCATS

Area	Well	No.	Section	Depth	Status
Athens	El Rey Oil Co., Westmore	1	2, 3-14	9063	Swabbing
	Melrose Pet. Co.	1	12, 3-14		Rig
Castaic	Lang, Ed. W., Rupy	1	7, 5-16	781	Idle
	Worland, C. C., Jenkins-Owens	1	18, 5-16	1950	Idle
Chatsworth	Fernando Oils, Ltd., Holmes	1	18, 2-16		Grade
Inglewood	Vanguard Oil Co., L.A.I.	1	29, 2-14	1491	Std. cem.
La Habra	Union Oil Co., Sansinena	12	31, 2-10		Location
Mint Canyon	Redwood Oil Co., Mitchell	2	22, 4-15	575	Cleaning out
Newhall	British-American Oil Prod. Co., Edwina	1	14, 3-16	4541	Bldg. steel derrick
	Canyon Oil Co., Sanborn	1	6, 3-16		Rig
	Consolidated Pet. Co., Needham	4	13, 3-16	4398	Idle
Palos Verdes	Rolling Hills Pet.	1	27, 4-14	6580	Idle
Puente Hills	Kasanke, J. F., Grazide	1	27, 2-10		Material
Sunland	Casa Grande Oil Co.,Lopez-Lundy	1	1, 2-15	2320	Swabbing
West Whittier	West Whittier Oil Co., Pellissier	1	17, 2-11	4400	Pumping 50 b/d
	Orange County				
Buena Park	Tucker, H. M., Heath	1	34, 3-11	5300	Stdg. cem.
Costa Mesa	Thompson, Milton N., Banning	1	9, 6-10	5560	Cleaning out
Garden Grove	Bird & Chambers	1	31, 4-10	1250	Idle
Stanton	United Oil Co., Schimming	1	25, 4-11	7100	Drilling

NORTHERN COUNTIES WILDCATS

County	Well	No.	Section	Depth	Status
Contra Costa	Tassajara Oil Corp.	1	9, 2s-1e	9727	Testing
	Tassajara Oil Corp.	2	9, 2s-1e		Rigging up
Monterey	Loma Grande Oil Co., Corey	1	23, 24s-10e		Rigging up
	Priest Valley Pet. Co., Greve	1	22, 20s-12e	2450	Idle
Sacramento	Amerada Pet. Corp., Carpenter	1	20, 4n-3e		Prep. to spud
Solano	Calaveras Cement Co., Calaveras-Elliott	1	30, 4n-3e		Rig
	Richfield Oil Corp., Potrero Hills	2	5, 4n-1w	4000	Abandoned
Sutter	Buttes Oilfields, Inc., McPherrin	6	1, 15n-1e	7650	Idle

4915 ft. The project is the first attempt by stockholders of Hollywood Turf Club to obtain high gravity oil production similar to that found by the several companies operating wells on the adjoining golf course of the Potrero Country Club.

Political difficulties are said to have indefinitely held up the drilling of Potrero No. 8 by Basin Oil Co.

Nine Drill At Athens-Rosecrans

Disregarding Apex Petroleum's Hatfield No. 1 and Royalty Service Corp.'s Riverside No. 1 which were attempting to complete, there were at press time nine wells actually drilling in the Athens-Rosecrans field.

Most of the activity and much of the interest is centered in the several wells on Compton boulevard., the deepest of which, Thos. Kelly & Sons' McMillen No. 2, would now be completed but for a faulty water shut-off which has just been remedied.

At the north end of production on 124th street, Thorley Oil Co. is coring for the old Athens zone at 4250 ft. It is planned to carry this well below 7500 ft. if necessary.

Shallow Hill Activity Maintains Even Rate

With a score of projects under way, Signal Hill is maintaining an even rate of development in the so-called upper Wilbur zone.

Completions generally are small and with cuts upwards of 10.0%. In some cases decline has been discouragingly rapid but most seem more than capable of repaying their modest cost.

Nearly all are now being finished with the pre-gravel-packed type of perforated liner, this being the first Long Beach boom since its introduction only a year ago.

J. E. (Jim) O'Donnell, veteran individual operator has entered the lists of deep zone drillers. At the corner of Patterson and Atlantic he is deepening Nelson No. 1 below 8100 ft. with the intention of carrying it to 11,000 ft. if necessary. Located as it is between De Soto's deep discovery well and El Hondo No. 1 at Spring street and American avenue, the well seems assured of some kind of production. The El Hondo project is standing idle at 10,050 ft. with a fish in the hole, but may resume operations shortly, according to Jack Rogers.

Allied Petroleum Corp. No. 34, below 10,000 ft. offsetting De Soto No. 1, is the only other deep zone driller.

Barnsdall Testing Ro. San Francisco 9

After recementing the shoe of 7 in. casing cemented at 6345 ft. and squeezing the top perforations of the 5½ in. drillable liner, Barnsdall Oil Co. is again testing Rancho San Francisco No. 9 in Newhall Potrero field. The liner contains 170 ft. of perforations and was landed on bottom at 7195 ft.

East of Barnsdall's production, Newhall-Potrero Oil Co. is preparing to drill a semi-wildcat, Ferguson No. 1.

Lebow-McNee Will Test Torrance Main Zone

Finding the Del Amo zone barren to 5250 ft., Lebow-McNee Oil Co. is plugging to complete Kettler No. 5 in the old Main zone at 3850 ft.

Hellman Estate Finishes Big Seal Beach Producer

Hellman Estate Co., which in the past few months created a miniature boom at Seal Beach, brought in another big well on its fee property.

Well No. 5, with casing cemented on

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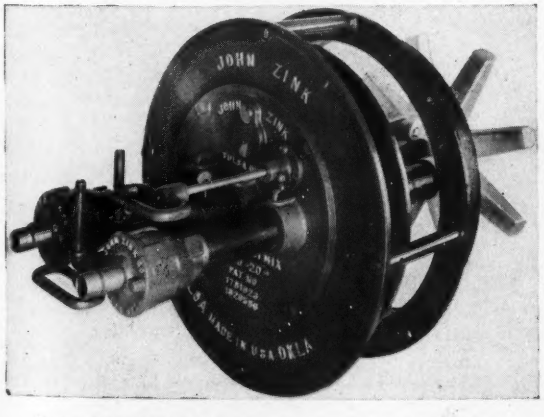

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bottom at 5038 ft., gun perforated from 4885 to 4860 ft. and 4850 to 4800 ft. to obtain a flow of 1150 bbls. a day of clean 28 gravity oil through a 32/64 in. bean.

In the same easterly section of the field, Continental Oil Co. is preparing to drill Bixby No. 43.

Two Wells Testing Huntington Flats

Two wells are working on the flat east of the main Huntington Beach field, one a new hole, the other an abandoned Standard Oil Co. producer. The new project is that of Johnston, Owens & Baker, Texas operators who are making their first bid for California production. A late report placed the bottom at 3300 ft. Moving rig and equipment from the Richfield for the second effort, J. C. (Slim) Theriot is cleaning out the abandoned Standard Oil Co. Farnsworth No. 3. Using a mill of his own design, Mr. Theriot is having little difficulty in reconditioning the old hole.

In the Five Points area, Clear View Oil Co. bottomed its No. 1 at 4280 ft. and with 50 ft. of formation open, is pumping an estimated 120 bbls. a day. Derricks are up for Geo. Duty's and W. T. Ball's new wells.

H. R. O. Oil Co. is having a little difficulty in obtaining steady production from its No. 1 at Joliet and Georgia Sts. which is plugged from 4785 ft. to the 2100 ft. tar zone.

All idea of making a deep test of South Basin Oil Co. No. 93 was given up because of mechanical difficulties and the well will be recompleted in the 3800 ft. zone. Greatest depth was 7575 ft. and was said to be in a fault zone.

In the Alabama street sector, The Petroleum Co. is rigging up to drill Wilson No. 6, a new well.

E. Coyote Field Activity Increases

With derricks up for two new wells and a third drilling, activity is on the increase in the old E. Coyote field.

On the north flank, California National Oil Co. has derrick completed for a test near the Sonwell holdings, while in the westerly section, Bartholomae Oil Corp. is completing a rig for well No. 9 on the Stern lease.

Sonwell Oil Co. is making slow progress in No. 2, being down only about 3200 ft.

Master Petroleum Corp. is reported to have deepened an old Chiksan well and to have obtained a yield approaching 300 bbls. a day.

Deep Aliso Test Stands Shut In

Porter No. 12, Tide Water Associated Oil Co.'s deep test of the Aliso Canyon field is standing shut in with 2920 lbs. registered on the tubing gauge and 2990 lbs. on the casing head. The well was allowed to produce only a few days after being completed during which the highest production rate was 225 bbls. of 54 gravity clean oil and approximately 12,000,000 cu. ft. of gas through a 32/64 in. bean.

Deepest of the three drilling wells on the Porter lease is No. 13, last reported at 4015 ft.

Here and There

Don Angle, Don Thompson and *Steve Dunlap* boomed out for Las Vegas to check what the natives fondly believe is a helium well. Don't know how much gas the boys saw, but we can guess what else. Hope the respective missus' don't read trade magazines.

Wonder if *Jack Samuelson* can still substitute two open windows for the long distance telephone system. Jack got that way as master of a vessel in sailing days.

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Coastal District

Superior Oil Plans Huasna Valley Wildcat

Superior Oil Co. is planning to start work at once on an important test of the Huasna Valley in San Luis Obispo county. Location has been chosen on the Tar Springs Ranch in the southeast quarter of sec. 24,32-14, northwest of the old wells of Texas Pacific Coal & Oil Co. and Barneburg Oil Co.

Drilled more than ten years ago, each old hole was carried to approximately 4500 ft., possibly bottoming in Cretaceous. Formations in the wells were generally very hard and much oil was encountered in shale fractures but real commercial production was not found.

Miocene shale outcrops at the site of the proposed new test indicating production may be found in that formation, Eocene or Cretaceous before the Franciscan schist basement is struck.

Union Oil Rigs Betteravia Well

Union Oil Co. is rigging up to drill its Pezzoni No. 1 in sec. 33,10-35 near Betteravia in Santa Barbara county. The project will seek Miocene production similar to that found in the nearby Santa Maria Valley where the Monterey series is the main productive horizon.

In the old Santa Maria-Orcutt field, Union Oil Co. is completing Calcoast No. 18 on the pump after bottoming at 4160 ft. Approximately 600 ft. of formation is open below the shoe of the water string.

Only actively drilling well in the Santa Maria Valley field is Fred E. Cole's Giacomini No. 1 in the westerly section. At last reports, a depth of 4400 ft. had been reached.

New Test Planned For Malibu Ranch

Soon to be tested are the undeniably good oil possibilities of Point Dume on the Malibu Ranch. Though no official announcement has yet been made, it is believed the well will be located near the ocean end of the point jutting out in the Pacific on the scenic Roosevelt Highway between Santa Monica and Oxnard.

Two wells have been drilled on the point in past years, the deepest stopping in Miocene short of 4000 ft.

Santa Clara Completes Shiells Canyon Gusher

With a perforated liner landed on bottom at 3224 ft. and 2½ in. tubing to about 2900 ft., Santa Clara Oil Co. recompleted its sensational No. 15 at Shiells Canyon flowing initially 275 bbls. a day of 29.3 gravity clean oil through a 47/64 in. bean. As 13 gravity oil had been circulated to kill the flow through the casing while running the liner and tubing, it is expected that gravity of the yield will return to 35 as the well cleans itself out. It will be recalled that the well came in while pulling drill pipe after deepening from 2700 ft. using oil for drilling fluid.

Much attention was directed to the Shiells Canyon area by the surprise completion and it is to be expected that the next few months will see an increase in activity. Already Santa Clara Oil Co. is preparing to drill a new well 350 ft. north of No. 15.

You are reading the Pacific Coast oil men's home paper.

COASTAL COUNTIES WILDCATS

Area	Well	No.	Section	Depth	Status
Santa Barbara County					
Betteravia	Union Oil Co., Pezzoni	1	33, 10-35		Rig
Carreaga	Arnold Oil Corp., Arnold-Apache	2	8, 8-33	6825	Idle
Goleta	Hamilton, W. C., Hollister	1	3, 4-29	1345	Idle
Lompoc	Sun-Bell Drilling Co.	1	28, 8-34	3064	Idle
Summerland	Oil Group, Inc., Hyland	1	16, 4-26	2205	Idle
San Luis Obispo County					
Arroyo Grande	California Fuel Oil Co., Elberta	3	5, 32-13	1190	Drilling
	Holly Oil Co., Meherin	1	7, 32-13	3375	Drilling
Huasna	Superior Oil Co., Tar Springs	1	24, 32-14		Location
Elk Horn	Calif. Pet. Prod., Irons	1	19, 10-24	2527	Idle
	Burrhus, V. E., Haberkern	1	21, 32-22	2730	Idle
Ventura County					
Conejo	Sulphur Springs Oil Co., Janss	1	33, 2-19	3000	Idle
Moorpark	Shafer, Frank, et. al.	1	30, 3-19	736	Idle
Piru	Sannes, K. Sande, Janes	1	21, 5-18		Grading roads
Santa Susana	K. C. Oil Co., Marr	1	32, 3-17	1014	Idle
Sespe	G. E. Development Co.	7	13, 4-19	725	Drilling
	Merchants Pet. Co., Cochrane	8	1, 4-20	2125	Drilling
	Hall, Henry Lynn, Tar Creek	1	35, 5-19	1275	Idle
	Renard Oil Co.	1	6, 4-19	1100	Idle
	Rio Hondo Oil Co., Cosby	1	14, 4-19	1198	Reaming
Simi	Levesque, G. M., Robertson	1	17, 2-18	2325	Idle
	Ohio Oil Co., Vail	1	10, 2-19	5714	Abandoned
South Mountain	Albatross Oil Co., Schiefferle	1	17, 3-20		Rig
	Mallon, Felix, Richardson	1	14, 3-21		Rig
Sulphur Mt.	Madison Oil Co.	1	24, 4-22		Rig

Snapped in Illinois

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Shell Finishes Two Ventura Producers

Shell Oil Co. recently brought in two wells in the Ventura Avenue field, one of which was exceptionally large.

Bottomed at 7100 ft., Shell's Taylor No. 114 came in to establish a potential of 3260 bbls. of 31.5 gravity clean oil, open flow. Pinched back with a 16/64 in. bean, production was 650 bbls. of oil and 770,000 cu. ft. of gas with 1350 lbs. on the tubing and 2200 lbs. on the casing. Two intervals are open from 6000 to 6835 ft. and from 6780 ft. to bottom.

Not quite so good was Shell's second completion, Taylor No. 115, which showed a capacity of 915 bbls. net with a cut of 15.0%. Open to production was the interval from 5645 ft. to bottom at 7090 ft. Both wells are located in the westerly section of the field.

British American Oil Producing Co. is drilling Barnard No. 1 below 4500 ft. and is preparing to spud Hartman No. 1 on the Bolsa Chica lease. Lloyd Corp. is below 3500 ft. in No. 5 in the northeasterly section and in the Avenue area, California Alliance Oil Co. is testing Hartman Ranch No. 2 after bottoming at 9500 ft. and is drilling Schmidt No. 1 at 5900 ft.

2nd San Ramon Well Planned By Tassajara

Tassajara Oil Corp. is reported to be planning to drill a second well approximately 300 feet from E. C. Rasmussen No. 1 in sec. 9,2s-1e near San Ramon in Contra Costa county. The first project, believed to be bottomed in Eocene at 9777 ft., is making a series of tests to determine the productivity of several showings encountered during the drilling. Top of the Miocene was noted at 4200 ft.

Holly's Pismo Well Drills Below 3500 Ft.

Now below 3500 ft., Holly Oil Co. Meherin No. 1 near Pismo is approximately 1000 ft. deeper than it was at first thought necessary to go for Santa Margarita production. Probably in formations of Lower Miocene age, cores taken in the last few hundred feet have been almost entirely grayish brown shale.

In the Arroyo Grande area, California Fuel Oil Co., Inc. is making slow progress in Elberta No. 3, the bottom being yet above 1500 ft.

Loma Grande Rigs Monterey Wildcat

For the second time since erection of the derrick in February of this year, Loma Grande Oil Co. is reported rigging up Corey No. 1, an exploratory project located near Bradley in Monterey county.

More Basin

Union Oil Leads Dominguez Activity

Most active company in the Dominguez field is Union Oil with two wells drilling, one rigging up, one testing for production and foundation in for two more.

Callender No. 76, Union's easterly offset to Havenstrite's Larronde No. 2, is preparing to complete after bottoming at 7565 ft., cementing 7 in. casing at 7075 ft., and gun perforating; a procedure new to this field.

On the Gardena Syndicate lease, the company is drilling Austin No. 1 at 3500 ft. and is preparing to spud No. 2 while foundations are in for new wells on the Carson and Callender leases.

On its large Reyes lease, Shell Oil Co. completed No. 102 at the plugged depth of 7950 ft. in the 7th Callender zone. Production was at the rate of 750 bbls. a day.

Only independent operators in the field at present are R. E. Havenstrite who is drilling Larronde No. 3 at 3650 ft. and Gibraltar Drilling Co., which is below 5500 ft. at the southwest corner of Victoria Ave. and Avalon Blvd.

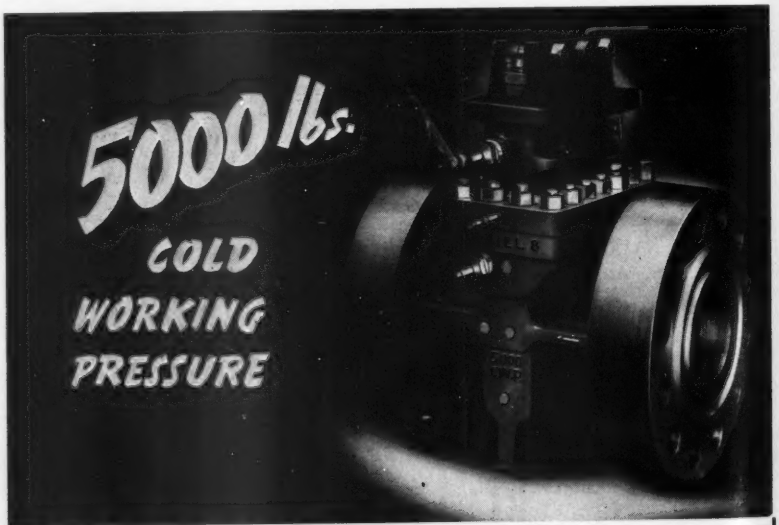
R. R. Bush Plans Inglewood Outpost

With the acquisition of the Bass & Goodknight Sentous lease, R. R. Bush Oil Co. is said to be planning to drill immediately. The new project, located on the westerly flank of the Inglewood field, will be carried to the Miocene unless the shallow zones are found productive.

Federal Oil Co., Smith No. 1 at the northwest end of shallow production is ready to spud in.

Here and There

As the guests of the *Charles Pierce's*, the *Don Ingersols* spent the past week-end enjoying the aquatic sports of Naples. From all the swimming, sailing, paddleboarding and rowing we betcha Don spent a blue Monday. Meanwhile we wonder if The Texas Co. obtained the real inside hop on Cheney Ranch.



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Stuck Pipe: Causes, Prevention, Recovery

An Informative Paper

A. P. I. Southwestern
Spring Meeting, 1940

By J. E. Warren
Carl B. King Drilling Co.

During the past few years, field experience and technical investigation have increased our knowledge concerning the causes and cures for fishing jobs. Marked progress has been made in the metallurgy and design of both surface and sub-surface equipment for drilling rotary wells. Noteworthy advances have been made in the technique of drilling, resulting in straighter holes and a better understanding of the properties of drilling mud and their application to field conditions. This improved technique has greatly reduced the hazards of fishing and many jobs that were common only a few years ago have been reduced to insignificance. However, with the advent of deeper drilling, smaller diameter holes and increased capacity for higher rates of penetration, new and different hazards have come into being. The expense of fishing jobs is still an appreciable percentage of the total cost of drilling wells.

A comprehensive paper by J. T. Hayward presents the only detailed published information on the subject of stuck pipe.[1] The purpose of this paper is to add to and expand some of the things brought out by Mr. Hayward. Blow-outs, heaving shale, mechanical failure of equipment and loss of returns are causes that stick pipe. These causes are associated with unusual conditions that are beyond the scope of this paper.

Almost every fishing job presents special problems and the judgment exercised by the operator in his analysis is most important in reaching a successful conclusion of the job. Among the many factors which must be considered are appraisal of the hole conditions, the "fish" with relation to the hole, and methods of recovery. In the case of a difficult fishing job, it is often less costly to sidetrack the fish or even abandon the hole rather than continue fishing. Fishing tools such as overshots, taps and baskets are generally carried as equipment by the average operator. Special tools used for fishing jobs of a complex nature are handled on a rental basis by fishing tool companies. These companies employ men who are trained and experienced in the proper use of the various special tools. However, the judgment of the operator prevails in making any decision as to the procedure to follow. There is an old axiom in the oil industry that "a fishing job is not generally bad until made so". This is true in a number of cases and the factor of judgment has an important place in the final cost of successfully concluding the job.

Many operators deliberately assume risk which may result in a fishing job because the additional savings effected by assuming these hazards are justified. Some notable examples of these are:

1. Cutting down the hole size to accommodate smaller casing.
2. Shortening the length of surface casing.
3. Elimination of protection strings of casing.

A certain percentage of fishing jobs are preventable by changing the drilling procedure; in these cases the cost of preventing fishing jobs is greater than the probable cost if the hazard is assumed.

Drill stem may become frozen or stuck due to a number of reasons. Some of them are peculiar to certain areas and to certain formations. In general, more trouble is experienced during the early drilling of an area than after a year or two of experience. This has been due to locating the peculiar hazards and eliminating them by changing the drilling technique. It has come to the attention of the writer that trouble sometimes runs in cycles in some areas. It has been noticed that a good many fishing jobs would be in progress at one

FIGURE 1
ILLUSTRATING KEYSEATING EFFECT
ON CROOKED HOLE

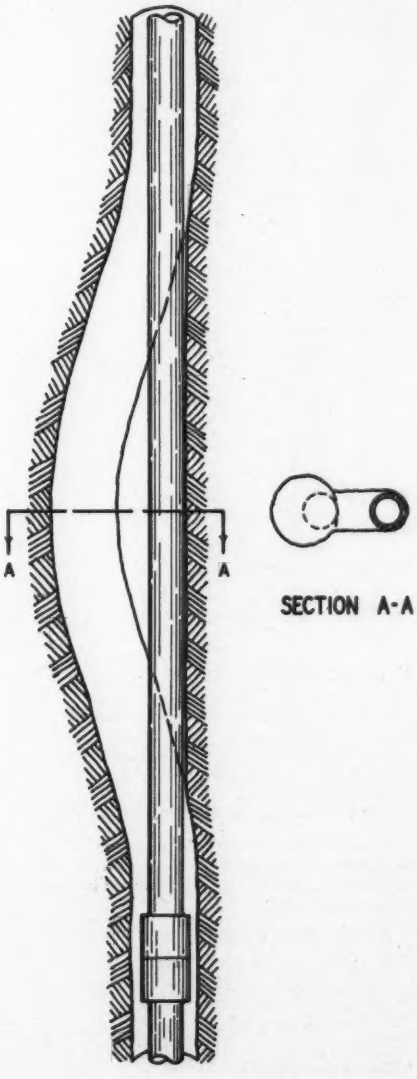

FIGURE 2
POSITION OF PIPE AFTER KEYSEATING

[1] "*Cause and Cure of Frozen Drill Pipe and Casing*" by J. T. Hayward, *Mid-Year Meeting, American Petroleum Institute, Colorado Springs, Colo., June 2, 1937*, Drilling and Production Practice, 1937, *page 8.*

FIGURE 3
DRILL COLLAR STUCK IN KEYSEAT

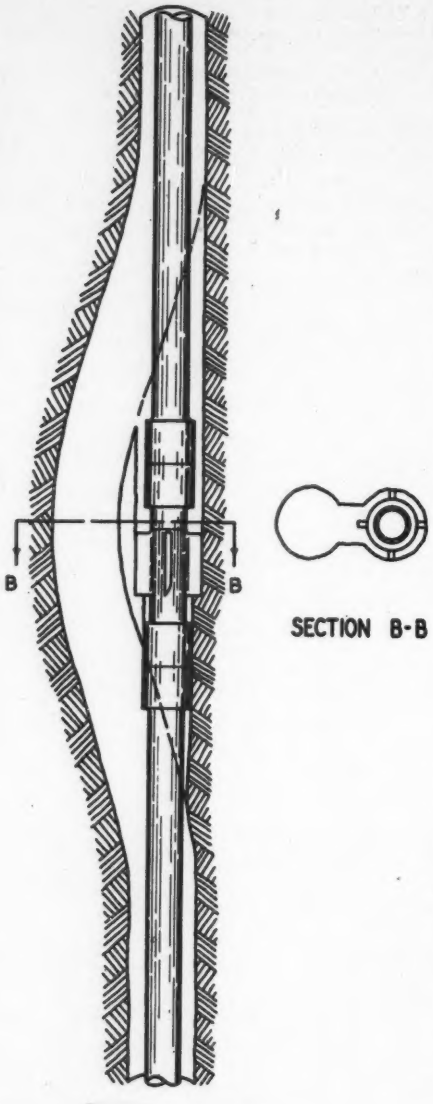

FIGURE 4
REAMER ACTION IN ENLARGING KEY SEAT

time and then for a period there would be a lack of trouble. Supervision and personnel probably become somewhat lax in taking precautions necessary to prevent trouble after a continued drilling period free of fishing jobs.

Causes of Stuck or Frozen Drill Stem

The causes of stuck or frozen drill pipe are many and often a combination of causes may be responsible. The common causes may be divided as follows:

1. Key seating.
2. Improper mud control.
3. Cuttings, sand and cavings.
4. Balling up.

Many cases of stuck drill pipe could have been avoided by proper diligence on the part of the driller. A good many strings of pipe have been stuck through negligence. The driller should always carefully consider the possibility of sticking the pipe if it is necessary to shut down the rig. If repairs are necessary that will not permit the rotation of the pipe, it is good practice to elevate the drill pipe off bottom, so that it can be lowered at frequent intervals.

Key Seated Holes

During drilling operations the lower portion of the drill stem is in compression and the upper portion in tension. A neutral point necessarily exists where the drill pipe in compression changes to a state of tension. The location of the neutral point varies with the weight carried on the bit and the weight of the drill assembly and drill pipe. It is considered good practice, when possible to do so, to design the drill assembly so that this neutral point is below the top of the drill collar. Where this is done, all of the drill pipe above the drill collar is in tension. The amount of tension progressively increases upwards through the drill pipe to the swivel. If, in drilling a well, the hole deviates from the vertical, and on continued drilling, this portion of the hole is opposite drill pipe in tension, a definite pulling action is exerted by the drill pipe on the wall of the hole. This pulling action combined with the circulation of drilling fluid, broaching action of the tool joints and rotation of the drill pipe, results in a tendency for the drill pipe to drill itself into the wall of the hole. Figure 1 shows diagrammatically a section of crooked hole illustrating the pulling action of the pipe and the broaching action of the tool joints on the wall of the hole. The extent of the crook is exaggerated for illustrative purposes. The extent of the key seating effect is a product of the tension in the drill pipe, character of the formation, nature and amount of the curvature of the hole, and the amount of time that the action proceeds. Figure 2 shows the position of the pipe after the key seat has been formed. Shales and soft formations afford conditions suitable for key seating, but the action has been known to take place in comparatively hard formations. Extreme cases of key seating have been observed where the drill pipe was stuck outside the periphery of the drilled hole.

The hazard of key seated holes has increased since the practice of drilling deeper wells has become general. One operator of a large fishing tool concern expressed the opinion that most of their jobs involving stuck drill stem were due to key seating. While it is difficult to evaluate the influence of key seating as a reason for stuck drill pipe, it is the writer's opinion that it is probably the most important single reason in the case of deeper wells.

Straight holes do not key seat and if wells are drilled nearly vertical, trouble from this source will be minimized. Since the size of the key seat is large enough to accommodate the tool joints, any trouble experienced is generally due to the "hanging" of the bit or drill collar. The tendency for pipe to stick in a key seat is greatest while pulling the drill stem out of the hole. Since pipe becomes stuck by pulling up in a key seat, it is always best to work the drill pipe downward as pulling up will result in sticking the pipe much tighter. Figure 3 illustrates how drill pipe is stuck by pulling drill collars into a key seated hole.

If it becomes apparent that a key seat is forming, it is good practice to keep it reamed to the diameter of the drilled hole. The usual procedure is to run a reamer in the drill stem located at a point above the key seat when the bit is at the bottom of the hole. Blade reamers are used for this purpose in soft formations, but it is necessary to use roller reamers in harder formations. Figure 4 shows the action of the reamer enlarging the key seated hole to the diameter of the drilled hole. It is important that the reamer be started above the key seat in order to prevent the formation of a shoulder. If the key seated condition has become so hazardous that it is inadvisable to ream while drilling, then the procedure is to underream the portion of the hole giving trouble. A type of underreamer should be used with a drill pipe connection on the lower end. Sufficient drill pipe is added below the underreamer, so that the same pulling effect that formed the key seat will be applied to the underreamer. Tapered drill collars are particularly hazardous

in a key seated hole. The wedging action of the taper will often stick the drill collar so tightly that it cannot be spudded or rotated loose. One operator installs a substitute on top of the drill collar which has a diameter equal to the largest diameter of the tapered drill collar. The substitute has a square shoulder which prevents the tapered portion of the drill collar entering and wedging in a key seated hole.

Pipe Stuck Due to Improper Mud Control

Mr. Hayward brought out in his paper the necessity of having sufficient gel-forming colloids in the mud to form a proper carrier for sand and cuttings and also act as a suspending agent, to prevent solids settling, in the event circulation is stopped.

Admixtures to increase mud weight, even if ground to colloidal dimensions, will settle and stick pipe if the mud is deficient in gel-forming colloids. It is important that a proper amount of gel-forming colloids be added to weighted mud in order that a state of suspension will be maintained if circulation is stopped.

Most formations are to some extent porous allowing the loss of water from the mud to the formation. The tendency of drilling mud is to build a wall in the hole to resist this action. The loss of water filtrate is proportional to the thickness of filter cake wall deposited in the hole.

Filtration characteristics exhibited by drilling mud have a definite relation to stuck drill pipe. The water filtrating into a formation may start a caving or sloughing condition. Also the deposition of filter cake on the walls of a hole results in reducing the drilled diameter by double the thickness of the filter cake. These conditions may result in sticking drill pipe and are very often the reason for sticking casing. Filtration of drilling mud increases (with increased depths) due chiefly to the increased temperatures encountered at greater depths. Filtration experiments made on drilling mud show that the thickness of filter cake and the amount of water filtrate into the formation are influenced by the following factors:

1. The quality of mud is very important. Poor mud will develop a very thick filter cake.
2. Increased temperature increases the amount of filtration and thickness of filter cake.
3. The time that a porous formation is exposed to filtration conditions is related to the thickness of the filter cake.
4. Pressure to a much lesser degree than temperature has an effect in increasing the thickness of filter cake.

Since temperatures increase with depth and also pressure, the problem of filtration becomes more important in deep drilling operations. Temperatures in excess of 200 deg. F. are encountered in the deep wells being drilled today. The effect of temperature increased from 80 deg. F. to 200 deg. F., has increased filter cake thickness as much as 150 per cent. The effect of temperature on filter cake thickness is illustrated in Figure 5 and Figure 6.* These pictures also illustrate the effect of mud quality in the deposition of filter cake. Mud while circulating is below formation temperature, but assumes formation temperature when circulation is stopped. Control of temperature and pressure is limited and filtration problems must be solved by changing the quality and character of the mud.

The addition of gel-forming colloids to mud which is uncontaminated with salt is very effective in reducing the amount of filter cake deposition. In areas where mud is contaminated with salt water, special colloidal admixtures have been helpful in reducing the amount of filtration.

Cuttings, Sand and Cavings

Well bores are not uniform in diameter throughout their vertical length. Caving, washouts and solution of soluble formation increase the well diameter at the points where the action occurs. The velocity of the circulating mud is reduced at points where the hole is larger than the drilled diameter. The reduction in velocity will allow some of the solid in the mud stream to settle out and accumulate at these points. These solids are kept agitated and buoyed up while circulation is maintained, but will settle downward and bridge around the drill stem if circulation is stopped. Tool joints restrict the annular space, and form perfect places for bridging and accumulation of settling solids. Since accumulation is likely to form on the top of tool joints, upward movement of the drill pipe will have a compacting effect and result in sticking the pipe. Large cavities in a well complicate the fishing for drill pipe which must be recovered in sections. Cavities allow the top of a drill pipe fish to lean over out of the original well bore.

The prevention of trouble originating from cavings, sand and cuttings can be minimized by proper mud conditioning. The design of mud pits, use of a shale shaker and addition of gel-forming colloids are effective in preventing the formation of cavities.

Pipe stuck while circulation is maintained may be due to the screening effect of a bridge, resulting in the accumulation of sand and other particles below the bridge. As circulation is continued the bridge grows downward as more and more particles are screened out of the mud. Shutting down the pumps and relieving the pressure or alternately starting and stopping the pumps have been effective in freeing pipe stuck from this cause. When circulation is stopped the lowermost portion of the bridge, which has been held up by pressure, melts away. The decaying of the bridge continues until the pipe is free. If alternately stopping and starting the pumps will not free the pipe, pinching the pump suction and creating a water hammer may be effective. It is recommended that tension should be pulled in the pipe in conjunction with the intentional use of water hammer.[1]

Balling Up

Balling up refers to the accumulation of sticky mud or formation on the bit or drill assembly. On withdrawal of the drill stem this accumulation is compacted and may stick the pipe.

Trouble from balling up has been experienced where high rates of penetration are possible, particularly while drilling at shallow depths. It is thought that the cuttings are not completely hydrated into mud and large chunks may accumulate while drilling progresses.

Balling up may occur as a result of the accumulation of filter cake on the bit or drill assembly while pulling the drill stem out of the hole. Proper conditioning of the mud and increasing the capacity of the circulating system is effective in eliminating trouble caused by balling up.

Methods of Recovering Stuck Drill Pipe

The methods for recovering stuck drill pipe are considered in two classifications. The first includes those methods used to free drill pipe while keeping the drill stem intact. Included are the use of oil, circulating clear water, gas slugging and mechanical methods such as spudding and bumping the pipe. The second classification includes those methods which are used in case the drill pipe can not be freed while it is intact as one unit. This includes "backing off," the use of inside cutters, shooting off pipe, "washing over," use of jars, etc. Some of the methods require the use of special tools and the service of operators skilled in their use. The application of these methods and a brief description of the procedure used is given in this paper. Drill pipe above the point where it is stuck is referred to as the free portion and that below this point as the stuck portion.

Methods of Recovery While Stuck Pipe is Intact

If a string of pipe is stuck off bottom it is considered good practice to work it downward rather than pulling up on it. Where pipe is stuck in a key seat by sand, cuttings or cavings, pulling up will often result in sticking the pipe tighter. If pipe will not work down by its own weight, it can often be freed by spudding. This is accomplished by pulling tension in the pipe and then suddenly releasing it, allowing the full weight of the pipe to act as a compressive downward force. Care must be exercised in spudding pipe, as it may result in kinking and bending the pipe in the hole.

Bumping Pipe

Pipe stuck near the surface can often be freed by bumping it back with the use of a bumper. One method of bumping pipe is as follows: Back off the kelley joint and add a joint of drill pipe so that the stuck drill pipe extends above the rotary table. Strip a joint of casing over the kelley joint so that it is free to slide up and down for a distance of 8 or 10 feet. Install a set of clamps or elevators on the drill pipe to afford a place for the casing to strike. The joint of casing is actuated by means of a cat line so that it bumps the drill pipe downward. This method provides an effective means of bumping stuck drill stem and can also be used for bumping the drill

**Figure 5 and Figure 6 appear in the May, 1936 issue of "Drilling Mud" published by the Baroid Sales Division of the National Lead Company. The article from which these illustrations were taken gives a detailed account of the filtration characteristics of drilling mud.*

1 *"Causes and Cure of Frozen Drill Pipe and Casing" by J. T. Hayward, Mid-year Meeting, American Petroleum Institute, Colorado Springs, Colo., June 2, 1937*; Drilling and Production Practice, 1937, *page* 8.

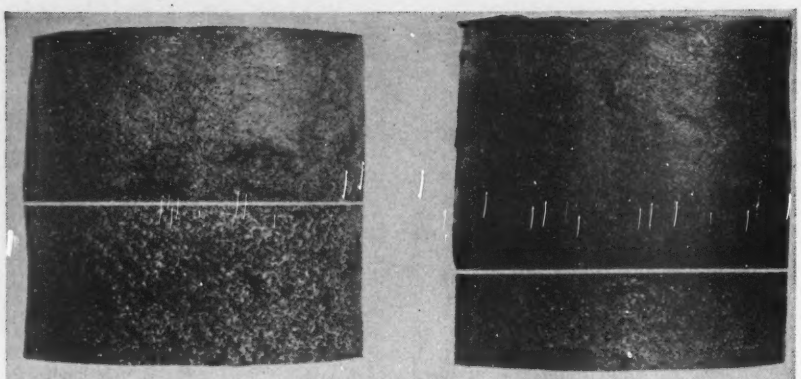

Figure 5—Filter Cakes (above white lines) deposited by low colloidal content mud. One at left at 80° F.—one at right at 200° F.

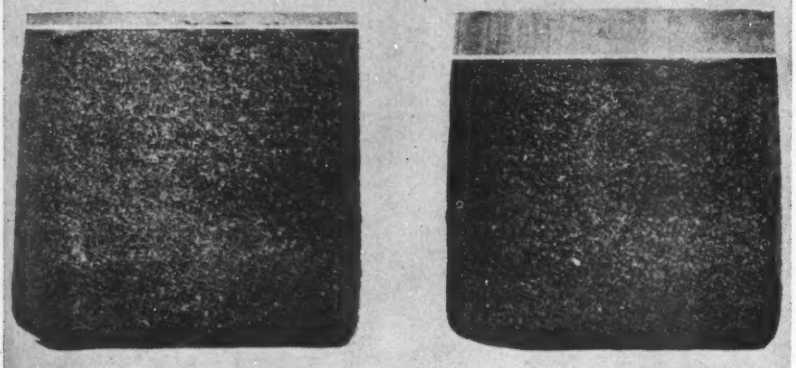

Figure 6—Filter Cakes (above white lines) deposited by AQUAGEL (high colloidal content.) One at left at 80° F.—one at right at 200° F.

pipe upwards. In fields where pipe is frequently stuck at shallow depths, it is advisable to make a bumper bar out of a cable tool stem. In this practice the bumper bar is made with a bail on its upper end, and of such a diameter that it is free to work inside of 6⅝" drill pipe. The bottom end is rounded off to make a good surface for striking the inside of a 6⅝" tool joint. A section of 6⅝" drill pipe is screwed into the top joint of stuck drill pipe to act as a guide for the bumper bar. A set of elevators or clamps must be provided to catch the drill pipe when it is bumped loose. The bumper bar is pulled up by means of a cat line, then suddenly dropped, exerting a considerable downward jar on the drill pipe.

A jigger bar actuated by means of a sand line has been successfully used in areas where it is not customary to use a back pressure valve in the drill stem. A striking mandrel is dropped in the drill pipe which will allow circulation through the bit. The jigger bar is raised several feet and dropped against the mandrel. This method has the advantage of transmitting the jar to the drill stem at the point where it is stuck.

If drill pipe is stuck so that it can not be bumped or worked loose, and circulation can be established, the operator can select a method involving a change in the characteristics of the circulating fluid. Careful consideration must be given to the danger of blowouts from gas formations or high pressure water horizons, as these methods reduce the density. The possibility of the circulating fluid contaminating the drilling mud and breaking down the walls of the hole must also be considered.

Lubricating with Oil

Lubrication with oil affords an effective means of freeing pipe particularly if the sticking medium is shale cavings or filter cake. The oil penetrates the cavings or cake that grips the pipe breaking down shale and clay particles. Sand grains and the outside surfaces of the stuck pipe are covered with a lubricating film. The internal friction of the sticking material and its gripping action on the pipe is greatly reduced by this process. There is a wide difference in opinion as to the proper use of oil for this purpose. The following procedure is recommended by the writer:

1. Determine the free portion of pipe in the hole. The total pipe in the hole less the free portion is the stuck portion.

2. Increase the colloidal content of the mud to reduce filtration and the settling action of solids. This is done to avoid further sticking of pipe in the free portion.

3. Determine the capacity of the drill pipe and the annular space for the length of the stuck portion of pipe.

4. The amount of oil to be used varies. The writer prefers an amount equal to about four times the capacity of the annular space for the length of the stuck portion of pipe.

5. Displace the mud in the drill pipe and the annular space of the stuck portion with oil. Careful measurements should be made to assure the proper "spotting" of the oil. If the volume of oil used is insufficient to fill the annular space and the drill pipe, mud is pumped after the oil to make up the difference.

6. Displace the oil further by pumping a small amount through the bit at regular intervals. The amount of mud return should be observed in order to determine the loss of oil to formation. If oil is being lost, the amount pumped at intervals should be increased to assure complete submergence of the stuck portion with oil.

7. If the height of oil in the drill pipe exceeds that in the annular space, the difference in hydrostatic head will be reflected by pressure at the top of the drill pipe. Releasing pressure in the drill pipe will allow oil to surge back through the bit if there is no back pressure valve in the drill stem. Alternate pumping and releasing pressure to create a washing action of the oil on the stuck portion of pipe is effective.

8. Opinions differ as to whether stuck pipe should be in tension or slack condition while lubricating with oil. The writer prefers the slack condition and recommends working the pipe at four hour intervals.

The action of oil in freeing pipe is dependent on the penetrating quality of the oil and the amount of time the oil is in contact with the material sticking the pipe. For this reason it is believed that a low viscosity crude oil will give the best results. Generally, stuck pipe will become free with twenty-four hours of exposure to oil, but many instances are known where forty-eight hours or more were required. It is sometimes possible to free pipe by circulating oil when the spotting method is unsuccessful.

Circulation of Water

The use of clear water as a means of freeing stuck pipe is preferred to the use of oil in many areas. Water does not contaminate drilling mud, and effects a considerable saving if the drilling mud is made up of costly admixtures. The procedure used is to fill the suction pit with clear water and start circulation, pumping the displaced mud in the reserve pit as it comes out of the hole. If the circulation of water is successful in freeing the pipe, mud should be turned into the suction pit and the water in the hole displaced without shutting down the pumps. Clear water has been circulated for periods as long as six hours without damaging effects to the walls of the hole.

In some cases the addition of Aquagel to the mud has been effective in freeing stuck pipe. It is important that the collodial content of the mud be built up when a string of pipe is stuck. This precaution will help limit the sticking action to the portion of pipe originally stuck and facilitate its recovery.

The introduction of gas into the circulating system is a method used where formation will not cave at reduced pressure. It is necessary that gas under pressure be available for this purpose. The procedure is to introduce gas into the stand pipe and allow it to displace mud in the drill stem. Mud is then pumped in the drill pipe forcing the gas slug down the pipe. The gas slug becomes compressed by reason of the hydrostatic head

of mud above it and consequently occupies less space. The average density of the fluid in the drill pipe is increased by compression and is reflected at the surface by a drop in pressure. This allows the introduction of another gas slug which is followed by more mud. Repetition of this process will force the first slug of gas through the bit, where it will be compressed to a pressure equivalent to the hydrostatic head of the mud in the annular space between the drill pipe and the walls of the hole. The gas expands as it travels upward and decreases the average density of the fluid in the annular space. The resulting drop in hydrostatic head permits the increased amounts of gas to be introduced in the drill pipe.

The velocity of the fluids in the annular space as a result of gas slugging greatly exceeds that which can be accomplished by the pumps. The jet effect resulting from the increased velocity is effective in washing cavings from around the stuck portion of pipe.

Hydrochloric acid is useful in freeing pipe which has been stuck in limestone or by limestone cuttings. The procedure is similar to that used in spotting oil.

Recovery of Free Portion of Pipe

If the pipe can not be freed as a whole, it then becomes necessary to recover it in sections. The first step then is to recover that portion above the point where it is stuck.

It is recommended that a safety joint be used in areas that are particularly hazardous. A safety joint installed above the drill collar provides a means of breaking the pipe at this point, and the drill pipe above the safety joint can be recovered. Safety joints are designed to unscrew by turning the drill pipe to the left. The construction permits unscrewing with much less breaking torque than is necessary to break the other joints in the string. This assures that the break will be made at the safety joint. Another advantage in using a safety joint is that a back off can be made and the hole kept in condition until a decision is made as to recovery methods.

It is important to know how much pipe is free above the point where it is stuck. Mr. Hayward[1] described two methods which have proven this value. His second method is preferable,[2] but can not be applied unless drill pipe in the stuck string projects above the derrick floor. The first section must be used if the kelley joint is partly in the hole. A variation of this method is described at the end of this paper.

Backing off pipe is a method commonly used to recover the free portion of pipe. It is important that the back-off be made as near as possible to the point where the pipe is stuck. The procedure is as follows:

1. Determine accurately how much of the pipe is free above the point that is stuck.

2. Make up all the tool joints with the rotary table by varying the tension on the drill pipe. (This is necessary in order to get nearly uniform torque in the make-up of each tool joint.)

3. Pull a measured amount of stretch in the drill pipe so that the neutral point is established just above the point where the drill pipe is frozen.

4. Make the "back out" by rotating the pipe to the left.

If the tool joints have nearly uniform "breaking out" characteristics, the back off will be made very near the neutral point. If the pipe breaks out above the neutral point, it is often possible to get a deeper "back out". Cleaning the lowermost joint with kerosene will assure that the next break will not be in this joint.

Use of Inside Cutters

Inside cutters used in conjunction with small diameter drill pipe has become increasingly popular where the service is available. The cutter is run on drill pipe small enough to permit its passage through the pipe to be cut. The tool is engaged to the stuck drill pipe by means of slips where a cut is desired. The blades are forced outward against the drill pipe by means of weight. The cut is made by slowly rotating the small drill pipe. Successively higher cuts can be made while the tool is in the hole. Inside cutters and drill pipe are available that will operate in all sizes of drill pipe that have inside measurements equivalent to or greater than three and one-half inch external flush drill pipe. Advantages of this method are:

1. The first cut can be made on top of the drill collar and successive cuts at higher intervals allowing maximum recovery of the free portion of pipe.

2. The stuck portion of pipe is cut in sections allowing wash-over and recovery without the necessity of making outside cuts.

3. Circulation can be maintained through the small drill pipe, affording a means of "washing-down" the cutter to the desired depth.

4. The cutter leaves a clean "top" on the pipe left in the hole for washing-over and fishing purposes.

Use of Left-Hand Drill Pipe

Left-hand drill pipe is made with all the screw connections opposite to that of conventional right-hand pipe. The joints are screwed up counter-clockwise. All joints in the tools used with the pipe must be of the same type. An overshot is run on the pipe and engaged to the fish. The procedure used in "backing off" is followed. Since rotating the pipe to the left will make up left-hand pipe the back-off will be made below the overshot. The procedure is repeated until all the pipe is recovered. Stuck portions of the fish may resist backing off and must be washed over before recovery can be made. If left-hand pipe is available, it can be used to advantage on certain types of jobs. Other methods are generally preferable because:

1. The fish may back off in two places and the bottom section drop off while being withdrawn from the hole.

2. Backing off the pipe in a key seat complicates further fishing, as the top of fish left in the hole may be out of the drilled hole.

Recovery by Shooting

Drill pipe is shot off by running a small charge of explosives inside the drill pipe to a point above where the pipe is stuck. The explosive is detonated by means of a time bomb. The smallest bombs are one and one-quarter inches in diameter. Sufficient tension is pulled in the pipe before detonation so that if the pipe is parted, it can be noted at the surface. In some cases the pipe is not completely parted and it is necessary to finish the separation by twisting it off with rotation. If the pipe is not parted in the first attempt it is assumed that the shot was too deep and another trial is made at a higher level. Shooting is often used when the operator elects to sidetrack the stuck portion of pipe. Shooting off pipe may leave the fish in the hole with a ragged "top" and complicate its recovery by further fishing.

Washing Over Pipe

In order to recover the stuck portion of pipe, it is often necessary to clean out the cavings or cake in the annular space around the pipe. This is accomplished by rotating wash pipe over the fish. Wash pipe is made up of casing which has an outside diameter less than that of the drilled hole and an inside diameter greater than the largest diameter of the fish. The wash pipe assembly is made up in the following manner: A rotary shoe is screwed on the bottom of the wash pipe. This shoe should have an outside diameter of at least ½-inch less than the diameter of the drilled hole. Vertical reaming ribs on the side and teeth on the bottom of the shoe will facilitate its action in recovering cuttings around the stuck fish. Table I shows recommended casing sizes for washover pipe for various size holes and the maximum diameter of fish to be washed over. The amount of casing used for wash pipe depends on the length of the fish to be washed over. Five hundred feet of wash pipe is considered the approximate safe limit under ordinary conditions. The wash pipe is swaged to the drill pipe and run in the hole on the drill pipe. After establishing circulation the wash pipe is slowly rotated over the fish. Sufficient pipe should be added to the wash string so that the first connection can be made without pulling off the fish. Minimum weight should be applied and the amount of binding action observed in order to avoid sticking the wash pipe. Safety joints designed for wash pipe are available. These joints have an initial diameter which will allow the use of an inside cutter if the wash pipe becomes stuck.

Use of Outside Cutters

Outside cutters are used in conjunction with wash pipe. The cutter engages the external surface of the stuck drill pipe. The procedure is as follows:

1. The stuck pipe is washed over to insure clearance for the cutter.

2. The wash pipe is withdrawn and a cutter installed in place of the rotary shoe.

3. The cutter is lowered over the fish to the desired level and engaged with the stuck drill pipe by means of slips or fingers. The cut is made by slow rotation of the wash string. The cut section of pipe is withdrawn in the wash pipe and the process repeated until all of the stuck pipe is removed from the hole. Each cut should be made at a depth above

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[1] *J. T. Hayward, "Methods for Determining How Much of a Frozen or Cemented Column of Pipe is Free." Presented at the American Petroleum Institute Mid-year Meeting, Tulsa, Okla., May 16, 1935* "Drilling and Production Practice, 1935", *Page 16.*

[2] *Personal Communication.*

TABLE 1*
RECOMMENDED CASING SIZES FOR WASH PIPE
(Dimensions in Inches)

HOLE	FLUSH JOINT CASING		COLLARED CASING	
Size	Recommended Size	Max. Allowable O.D. of Fish	Recommended Size	Max. Allowable O.D. of Fish
5⅝	4½	3⅝	5½	4⅝
6¾	5¾	4⅞	5¾ & 6	4½ & 4⅞
7⅞	6⅝ & 7	5¼ & 5⅝	7	5⅞
8¾	7⅝	6¼	7⅝	6½
9⅞	8⅝ & 9	7¼ & 7⅝	9	7⅝
11	9⅝	8	10	8¾
12¼	10¾	9⅛		

*—Table 1 shows casing sizes for various sizes of holes and the maximum outside diameters of the fish that can be washed over. The recommended dimensions are considered safe, but may be exceeded under certain conditions.

the preceding wash over operation. This insures the entrance of the fish into the wash pipe in preparing for the next cut.

Stuck portions of drill stem that can not be washed over can sometimes be recovered by the use of rotary jars. Jars are used in conjunction with an overshot or other gripping tool. They deliver upward impact blows and should be located as near as possible to the fish for maximum effectiveness. Pipe stuck due to being fouled by a metal object or by being crooked can often be freed by jarring.

Side-tracking or abandonment of the hole are the two alternatives if all recovery methods fail.

Mr. Hayward's first method for determining the amount of free pipe is based on changing the longitudinal stress and measuring the stretch due to the change. It is suggested that this method be varied by using a predetermined amount of stress in order to simplify its application. The procedure is the same and is briefly reviewed as follows:

1. Fix a base point for measurement that will not be changed by increased load on the derrick.

2. Attach a lathe or strip of paper on the drill pipe so that accurate stretch measurements can be marked from the base point.

3. Pull sufficient tension in the stuck pipe to overcome the weight of the pipe in the hole. Note the weight indicator reading and mark this point on the measuring strip.

4. Pull further tension in the pipe and then slack off to the same weight indicator reading. Mark the measuring strip at this point. The difference between the two marks is accounted for by friction in the sheaves and the pipe in the hole. Draw a line midway between these points and use it as the upper point of measurement.

5. From the table of factors below select the amount of stress in pounds pull that is suitable for the particular job. The stress selected should be converted to the weight indicator scale and added to the reading used in determining the **upper mark.**

6. Pull the predetermined amount of stress in the pipe and mark the measuring strip.

7. Pull additional tension in the pipe and slack off to the above reading and mark the strip. A line midway between those last two marks is the lower point of measurement.

8. The distance in inches between the **upper point** and the **lower point** is the stretch due to the selected stress pulled into the pipe.

9. Multiply the stretch by the correct factor listed below to arrive at the length of the free portion of pipe in the hole.

10. Table 2 shows the multiplication factors for various weights and sizes of drill pipe.

TABLE 2
MULTIPLYING FACTORS*
These factors multiplied by the stretch in inches equals the length of free pipe in the hole.

Outside Diameter of Drill Pipe	Weight Per Foot	**Minimum Yield Point in Pounds Pull	Stress in Pounds Pull on Drill Pipe (Stress Pulled Between Upper and Lower Points)				
			30,000	60,000	90,000	120,000	150,000
3½	11.2	165,876	263.4	132	87.84	66.0	52.78
3½	13.3	199,151	316.4	158.4	105.5	79.27	63.40
4½	16.6	242,409	385	192.8	128.38	96.47	77.15
4½	18.10	273,116	422.5	211.58	140.9	105.9	84.66
5¼	22.2	325,944	503.5	252.13	167.89	126.16	100.89
5¼	25.25	369,819	586.2	293.56	195.5	146.9	117.47
6⅝	25.20	358,941	570	285.46	190.08	142.84	114.23
6⅝	31.90	462,273	734.2	367.7	244.85	184.0	147.14

*—The multiplying factors calculated by using the plain end area of the pipe; 5 per cent was added to take care of the length of tool joints.
**—Minimum yield point calculated at 55,000 lb. per sq. in.

Central Committee Action Announced

Pressure of an estimated 14,041 bbls. of daily allotment from 133 wells to be completed during the present month only partially offset by declines in production of old wells, required reductions to 174 bbls. per day for top wells and a further reduction in the power factor for intermediate wells by the Central Committee of California Oil Producers at its meeting last week. The committee maintained the total State Allowable for May at the same level as for April, 592,000 bbls. per day.

The committee also discussed the proposed revision of the Uniform Curtailment Formula but because of the imminent election of a new committee took no final action on its adoption. The committee did, however, recommend the proposal for favorable consideration by the new Central Committee, which is being voted upon by operators at the present time and which will organize early in May.

The discussion, led by L. L. Aubert, chairman of the Allocation Committee, which proposed the revision of the formula, emphasized that the recommended changes are made necessary by the constant bringing in of new wells.

The proposed revision, calling for a gradual reduction in the minimum allotment, a gradual reduction in the top allotment and a gradual reduction of the Power Factor which principally affects the so-called intermediate wells, will result in a projected top allotment of 155 bbls. per well per day by January 1, 1941, whereas continuation of the present formula would bring the top down to 135 bbls. per day by the same date.

It was emphasized that all classes of wells will be equally affected by the proposed change, and that all would contribute equally in reduced production. The program contemplates the retention of the total State Allowable at approximately 592,000 bbls. per day and is designed to make room for the addition of approximately 12,000 bbls. per day of new allotment per month for new wells by requiring a greater potential to qualify a well for the top brackets and by gradually reducing the allowable for intermediate wells.

It was pointed out that the change would affect wells of up to 200 bbls. potential per day very little and that it merely redistributes allowable production by giving greater proportional weight to potential rather than to depth.

Here and There

Mort d'Evelyn, spritely geologist in the Hogan Pet organization, made a flying trip recently up north to his Bay City home.

Whitey Eastham, Royalty Service Corp.'s Wilmington superintendent, missed the boat when a small rectifying plant burned right in his own baliwick. Practically never is he without some sort of camera, but while tanks boomed, foamite streamed and other "pic" fans clicked shutters, Whitey stood pathetically by with empty hands.

Purchasing Personnel-ities

By Leo S. Busby,
Associate Editor,
Southwestern Purchasing Agent

The Union Oil Company

Numerologists would have us believe that behind almost every number we might think of there is a definite occult meaning. We may agree or not, but there is no denying that for most of us certain numbers do have a particular significance. The number 13, for instance, may remind us of the day our mother-in-law came to live with us, or, perhaps, it may merely send us back to the days of our childhood when we struggled through the 13 original colonies. If we are old enough, the number 23 may prompt us to say "skiddoo" in the approved manner of the wise-crackers of the year 1911. The number 48 gives us

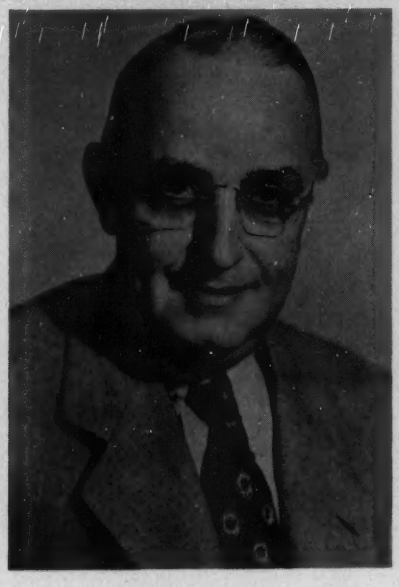
Harry C. Farquhar

a mind's-eye flash of white stars on a field of blue; and 49 brings to our ears the creaking of wagon wheels enroute to California's gold fields. In 57 we find a decided satisfaction in the contemplation of bottles and more bottles of delicious, crisp pickles, and in 65 we anticipate the day when Social Security will permit us no further labors and our digestion will admit no more pickles. And in 76—ah, what does that number bring to our minds? Right! The Union Oil Company!

For purposes of this page, we shall try to introduce to you a few of the men of 76 as we found them on a recent visit to the Purchasing Department offices in the Union Oil building on 7th street in Los Angeles.

The buying department of the Union Oil Company in Southern California is one of the largest in the oil industry in this state, with nine buyers in Los Angeles, and four at Santa Fe Springs. The entire department is under the direction of Mr. H. C. Farquhar, manager of purchases.

No doubt, most of us in the oil industry are familiar with Mr. Farquhar's record with Union since he recently received many testimonials in local journals on completion of his thirtieth year with the company. Beginning as a price clerk with the Union Well Supply Company, a purchasing subsidiary of Union Oil, he later became purchasing agent for that concern. In 1913, when the Union Well Supply Company was dissolved, the Union Oil Company organized its own



A. J. McGurn

purchasing department and Mr. Farquhar took on the duties of assistant purchasing agent. In 1922, he was made purchasing agent, and in 1924 assumed his present position as manager of purchases.

Mr. Farquhar is an active member of the Purchasing Agents Association of Los Angeles and the National Purchasing Agents Association. He is also a member of the Oil Buyers' Committee in the latter organization.

Aside from a penchant for making things grow on his beautiful ranch at Newhall, Mr. Farquhar's chief diversion is the game of bridge. We've often wondered what a P.A.'s reaction is when, after spending a day at the office giving all his attention to the lowest bids, he sits in a game of bridge in the evening and finds himself giving all the play to the highest bidder.

It has often been said that a man is judged by the company he keeps and we suppose we might safely assume that an executive may be judged by the assistants he chooses. In A. J. McGurn and E. H. Weaver, Mr. Farquhar's reputation is in capable hands. Because of his two year seniority, we shall first take up the case of Alex McGurn.

"Mac"—as he is familiarly known—came to California from smoky Pittsburgh in 1911 and shortly after was employed by the Union Well Supply Company. At the time of its dissolution in 1913, Mr. McGurn along with Mr. Farquhar, joined the newly organized Union Oil Company purchasing department as a buyer. Not long after, he was made assistant manager of purchases, a position he has retained since that time. His present work is in the nature of general supervision of purchasing with the buying of tubular goods his specialty.

Mr. McGurn is another P. A. who gets as much kick out of a little deal over a bridge table as he does out of a big deal over a mahogany desk. With his ready wit and his gift for story telling, he's a partner you'd really forgive for trumping your ace. But don't get us wrong on this story telling, we understand Mac has never even heard of Confucius!

Years ago, when William Penn put over that deal with the Indians, he must have set up some sort of purchasing agent precedent for future sons of Pennsylvania for we find that E. H. ("Buck" to you) Weaver is also from the Keystone state. That nickname, incidentally, is a holdover from his schoolboy days when a famous big league star was the current attraction at the local ball park.

"Buck" Weaver's service with Union Oil dates back to 1918 when he was first employed as a buyer. After three and one half years on the job in Los Angeles, he was transferred to Seattle to open a Northwest purchasing office. Here he

E. H. Weaver

spent four years as assistant purchasing agent and then was made District Purchasing Agent, a position he filled for twelve years. About a year and a half ago, he was recalled to the head office at Los Angeles, and appointed assistant manager of purchases. His present work consists of supervision of marketing and service station equipment, supervision of mechanical office equipment, and special assignments.

"Buck" Weaver is a familiar and a popular figure at the meetings of the Purchasing Agents' Association of Los Angeles, and is chairman of the Noon Luncheon Meeting Committee of that organization. He has many other outside interests, also, and takes an active part in Y.M.C.A. management and Community Chest activities.

Among Buck's favorite pastimes we find swimming, volley ball and gardening. We suspect, however, that the latter was mentioned in error, for we've never seen a pair of shoulders like Buck's on a gardener.

There's no concern in the world could do so much business today without proper stationery and office supplies and Union Oil is no exception. As long ago as September, 1917, Union Oil took on Mr. W. H. Gray to look after its

printing and stationery needs. The next time you get an invoice from Union, if the attractive way the bill is printed makes it just that much easier to pay, you can thank Mr. Gray who came all the way from Casey, Illinois, for just that purpose.

Mr. Gray's daily contact with a hundred and one intricate details fits him admirably for expertness in his favorite game of monopoly. His favorite form of exercise is swimming and we'll lay you ten to one that Buck Weaver has already sold him a membership in the "Y".

Wherever you find a dozen oil men, one at least will be from Texas. Roland R. Fenton is Union's man from Dallas, and has all the easy-going, rattle-proof attributes peculiar to the folks who can't forget the Alamo. Roland joined the Union on March 16, 1921, as a price clerk in the purchasing department. About three years later, he started on his career of buying, specializing at the present time in the purchase of ships stores and service station supplies.

Roland spreads his off-the-job interests among his three favorite pastimes—fishing, bowling and swimming. As regards the latter, we again suspect the delicate finger of E. H. "Buck" Weaver.

Eight years ago when the Union purchasing department was in the market for likely purchasing material, it dipped into the Union engineering department and came up with Clark S. Meade. "C. S." hails from Freemont, Michigan, and had worked in the engineering department for ten years before he was drafted by the P.A. Clark's work now is chiefly in the interest of service station supplies and advertising signs, with now and then, a special assignment for variety. His early engineering training has given him an amazing capacity for figures, and if you had ever seen him wrestling with his four husky youngsters, you'd know the figures we mean aren't the kind found in Earl Carrol's show.

Clark is something of a nut on automotive history and aeronautics, and is an avid disciple of Isaac Walton. What? No swimming? Why, Buck!

An engineer in a buyer's chair at first thought might suggest a square peg in a round hole but when you consider the technical knowledge necessary in the purchase of engineering and mechanical equipment, you realize at once that an engineering training is undoubtedly a most ideal preparation for such a position.

Lee S. Hall is an engineering graduate of Purdue University and has been a buyer with Union since February, 1923. His technical background and his keen interest in things mechanical fits him perfectly for his task of purchasing engineering, mechanical and automotive equipment. When Lee isn't tinkering with engines or motors, you'll find him in his backyard doing a little gentle gardening, that is, if he's not down at the local bowling alley doing a little gentle cussing because he can't seem to hit the head-pin.

The youngster in the Union Oil purchasing family is young Frank McMullen, Junior, who was made a buyer in October last. He's now breaking in his buying teeth on such materials as new equipment for service stations, and general supplies for refinery and pipe line warehouses, which would seem to be a most healthy bite for almost any buyer. Frank has been one of the men of 76 since March, 1930, when he came to the purchasing department as a junior clerk. If personality, application and enthusiasm will turn the trick, Frank should soon be wearing a full set of purchasing molars.

Frank's self-declared leisure activities include amateur radio production, horseback-riding, gardening (we happen to know Frank's dad who says it's a heck of a job to get him to cut the lawn!) and swimming. There's that swimming again! We noticed that Frank's office is next to Buck Weaver's. Wonder if———?

Union's largest sphere of production activity is at Santa Fe Springs, and in Charles S. Perkins it has a most capable district purchasing agent. Charlie is a native Californian with a happy capacity for maintaining most pleasant relations with the company personnel and the sales fraternity. He is a converted production man and his knowledge of drilling and production equipment is invaluable in the purchase of such materials. In addition to his purchasing duties, he also acts as general storekeeper.

Charlie has been with Union since August, 1926, and has worked as a clerk, drilling tool foreman, salvage foreman, and assistant general storekeeper. On July 15th, last year, he was appointed to his present position. His relaxation takes on the form of golf and home movies. No—— no swimming.

To help him in keeping the drillers drilling and the pumpers pumping, Charlie Perkins has a crew of three buyers at the Springs.

There's "Jeff" Raffi, who is a native of Baja California, and has been with Union since 1926. For the past ten years he's been buying general oil well supplies at Santa Fe Springs. Jeff admits to a certain degree of proficiency in fishing, bowling and cabinet making.

Then there's Jack Rojas, a native son, who came to Union during the World War, in April, 1917. He spent four years as a warehouseman, and from 1925 to 1931 was storekeeper. Four years ago, he was made a buyer and he, too, directs his attention to the purchase of general oil well supplies. When Jack isn't shooting golf he's got a gun on his arm tramping the hills looking for quail or what have you. He's also a musician of no mean ability.

And now we find another son of that breeder of P. A.s—Pa., or to spell it for you, Pennsylvania. Along with Alex McGurn and Buck Weaver, Bill Hirth left the good state of William Penn to come to California to exercise his purchasing power. Bill started the hard way in 1922, unloading pipe and lumber, spent two years as pipe yard man rolling pipe, and twelve as a warehouse clerk. Four years ago he moved up to a buyer's desk and now takes a hand in securing those much needed oil well supplies.

Bill boasts of only one mild outside interest—fishing. He says they seldom get away from him for the simple reason he seldom hooks them.

Lane-Wells, Eastman, In Patent Transaction

Rodney S. Durkee, president of Lane-Wells Co., announced the sale, effective April 16, 1940, of Lane-Wells Directional Drilling Equipment and Patents to the Eastman Oil Well Survey companies. The Orienting patents under which the Eastman companies are licensed, will be retained by Lane-Wells, who will continue to manufacture Orienting Equipment for export sale and to perform both Oriented and Magnetic Surveys.

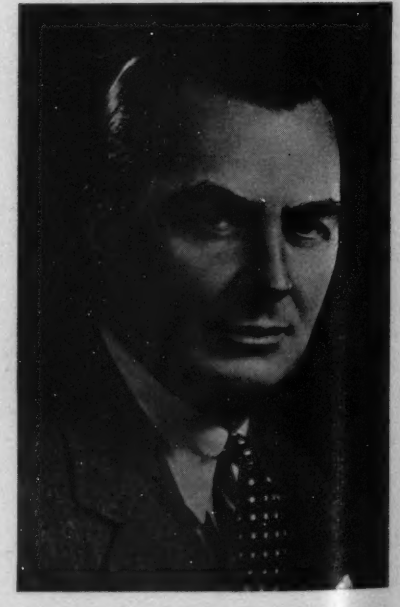
Lane-Wells Technical Oil Field Services include Gun Perforating, Electrolog, and Magnetic and Oriented Oil Well Surveys in all fields in the United States and Canada. The company manufactures Packers, Liner Hangers, and Bridging Plugs for foreign and domestic sale, and Gun Perforating and Survey Equipment for export sale only.

Here and There

According to *Bob Burns* of MacDonald & Burns, the movies aren't so bad after all. M. G. M. has just hauled in tons of gravel, cut the weeds, painted the tanks and generally improved their Torrance property and, believe it or not, is paying well for the privilege. *Archie MacDonald* has been unable to sign Clark Gable up for a roughneck.

One of the cleverest things we've seen in a long time was the "Scout Sheet" announcing the "bringing in" of *William Dana Prior*. Listed in the report were the following:

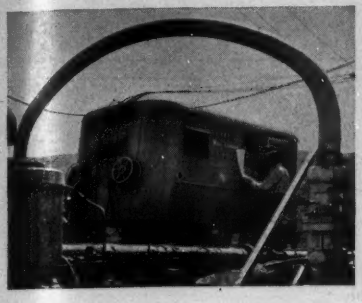
Company—*Bob Prior, Inc.*
Location—Hollywood Presbyterian Hospital.
Project—*William Dana No.* 1.
Date Completed—4-14-40.
Initial Production—8 lbs. 6 ozs.
Cut—Slightly wet at times.
Gravity—100%.
Remarks—Further projects indefinite.
Our congratulations to Bob Prior, Inc.

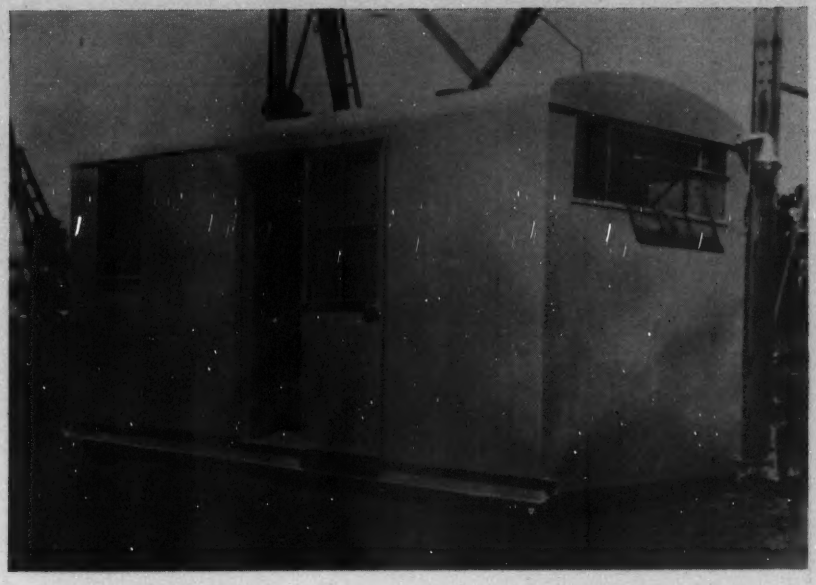


George J. O'Brien, recently elected treasurer of Standard Oil Co. of Calif. to succeed V. F. Palmer, resigned, joined the company in 1920, entering the treasurer's office nine years later and rising to the position of assistant treasurer in 1931.

New Well Logging Service In Baroid Tulsa Exhibit

To most advantageously display the new Baroid Well Logging Service for the benefit of visitors to the International Petroleum Exposition in Tulsa, 400 square feet of space has been taken by the Baroid Sales Division in the Oklahoma Building (spaces 83, 84, 127 and 128) as well as 800 square feet of space for an outside display in Block 3.





The Baroid Well Logging Service has attracted widespread attention because of its entirely different basic theory and the fact that continuous well logging is accomplished right at the time of drilling and without interruption of drilling operations.

In drilling a well, the bit drills up and disintegrates a circular core of the formation being drilled. If gas, oil or salt water are contained in the pore spaces of this core when it is drilled, the content of the pore spaces must of necessity be picked up by the drilling fluid. If the drilling fluid is continuously analyzed upon its return to the surface and correlated with the depth from which the cuttings came, the gas, oil or salt water content of the formation can be accurately determined.

The interior exhibit will display a Well Logging instrument panel showing how the various analyses and correlations are obtained and instantly recorded, thereby affording a constant and up-to-the-minute check on drilling progress and subsurface conditions.

Also on display here will be the results of many exhaustive tests on Baroid drilling mud products which include: Baroid, Aquagel, Colox, Stabilite, Smentox, Fibrotex, Zeogel, Baroco, and Aquagel-Cement. The complete line of Baroid drilling mud testing equipment will also be on display.

The outdoor exhibit will be entirely devoted to the Baroid Well Logging Service. A logging trailer used for this service, fitted with full equipment, will be displayed.

Representatives in attendance: G. L. Ratcliffe, general manager of Baroid Sales Division; W. L. Heater, Pacific Coast District manager; D. A. Sikes, Mid-Continent District manager; H. H. Farnham, Gulf Coast District manager; R. W. Wilson, and D. H. Larsen.

L. W. Huebel, E. C. Meyer, A. A. Roberts, A. C. Smith, R. Johnston, and E. E. Huebotter.

H. A. Barthelow, J. M. Bugbee, R. C. Marr, G. G. Bloxsom, G. C. Wahlstrom, J. Long, N. T. Randolph, G. H. Moore, and F. B. Williams.

Ideco Introduces Portable Dog House

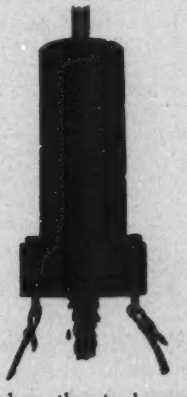
Ideco has developed a neat type of portable dog house for use on drilling rigs. These units can be supplied in various sizes and with window and door arrangements to meet the requirements of the individual operator.

Features include explosion-proof lighting with interior and exterior outlets, interior outlets for drinking fountain and plug-in connection adjacent to the derrick leg; built-in clothes hangers; built-in steam heating coils and guard over same; built-in bench; built-in tool board with single panel cover attached on inside; and a portable subbase of proper elevation. Built-in knowledge box and locker arrangements are "custom tailored" to meet individual requirements.

International Derrick and Equipment Co. of California maintains manufacturing facilities at Torrance and sales offices in Los Angeles and Bakersfield.

Patterson-Ballagh Rubber Wire Line Wiper

A new type of wiper has been introduced by Patterson-Ballagh engineers. It is an all-rubber unit for wiping the wire line. By its use, excess oil or mud which usually drips to the rig floor is wiped off the line cleanly and falls back into the hole. There is no metal to contact the line or to create a fishing hazard. This wire line wiper can be quickly



removed when the tool emerges, and thrown to one side. It consists of a heavy rubber sleeve and rubber flange or collar, integral. The sleeve is spirally split from the top to the bottom of the lower flange so that it can be distorted for insertion around the wire line. It is approximately 10 in. long by 4 in. diameter and weighs 5 lbs. When hooked into place, it is held in position by short pieces of line on each side, holding the wiper with "I" bolts. Further details may be obtained from Patterson-Ballagh Corp., 1900 E. 65th St., Los Angeles, Calif.

Here and There

In to see us was *Ray Cutting*, former Standard Oil man and independent lease hound, who is now affiliated with The Petrol Corp.

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Oil Men's Calendar

C.N.G.A. Meeting First Thurs. Each Month.

April

18-19—National Petroleum Assn., 37th Semi-Annual Meeting, Cleveland Hotel, Cleveland, O.

MAPS

Large maps of Los Angeles Basin oil fields and map showing all California oil fields. Price $15.00 each on paper and $20 each on cloth. Individual state oil and gas maps of Mid-Continent and Rocky Mountain regions. Maps show geological cross sections at base. These maps indicate wells drilling, wells producing and abandoned, with depths.
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24-26—American Institute of Mining & Metallurgical Engineers, Open Hearth Conference, Pittsburgh, Pa.

May

1-3—Petroleum Industry Electrical Assn., Dallas, Texas.

6-10—American Gas Assn., Natural Gas Section, Houston, Tex.

13-15—American Institute of Chemical Engineers, 32nd Semi-Annual Meeting, Statler Hotel, Buffalo, N. Y.

15-17—Natural Gasoline Association of America, 19th Annual Convention, Hotel Tulsa, Tulsa, Okla.

18-25—International Petroleum Exposition and Congress, Tulsa, Okla.

27-31—American Petroleum Institute, 10th Mid-Year Meeting, Blackstone & Texas Hotels, Fort Worth, Tex.

June

9-14—Society of Automotive Engineers, Summer Meeting, The Greenbriar, White Sulphur Springs, W. Va.

17-20—American Society of Mechanical Engineers, Milwaukee, Wisc.

24-28—American Society for Testing Materials, Chalfonte-Haddon Hall, Atlantic City, N. J.

California Crude Oil Production

Two Weeks Ended April 13, 1940

	April Daily Quota	Average Daily Production	Excess
San Joaquin Valley			
Beiridge—North	11,818	10,979	*839
Beiridge—South	2,063	1,968	*95
Buena Vista	16,422	16,925	503
Canal	5,754	5,645	*109
Coalinga-E. (Eocene)	14,518	14,863	345
Coalinga—East-West	15,186	11,009	*4,177
Cole's Levee	4,400	5,045	645
Edison	2,286	2,406	120
Elk Hills	6,828	12,286	5,458
Fruitvale	5,851	6,306	455
Greeley	3,728	3,484	*244
Kern Front	7,285	6,294	*991
Kern River	6,768	4,070	*2,698
Kettleman No. Dome	34,397	51,374	16,977
Lost Hills	3,902	4,090	188
McKittrick	3,723	3,527	*196
Midway	37,046	40,793	3,747
Mount Poso	9,420	10,240	820
Mountain View	8,401	9,249	848
Rio Bravo	7,832	8,260	428
Round Mt. and Coffee Canyon	7,087	7,392	305
Ten Section	8,741	8,640	*101
Wasco	1,429	1,196	*233
Other Fields	3,521	3,428	*93
TOTAL	228,406	249,469	21,063
Coastal Counties			
Elwood	3,592	3,773	181
Rincon	2,605	4,019	1,414
Santa Maria	5,969	3,969	*2,000
Gato Ridge	2,273	755	*1,518
Santa Maria Valley	17,972	14,209	*3,763
Santa Paula-Newhall	5,839	6,398	559
Ventura Avenue	31,373	31,210	*163
Other Fields	5,338	5,768	430
TOTAL	74,961	70,101	*4,860
Los Angeles Basin			
Alamitos-Seal Beach	7,110	7,390	280
Brea-Olinda	8,041	5,726	*2,315
Coyote—East	3,345	3,200	*145
Coyote—West	10,110	6,326	*3,784
Domingues	16,653	20,862	4,209
El Segundo	2,361	2,536	175
Huntington Beach—New and Old	22,691	27,794	5,103
Inglewood	12,390	12,330	*60
Long Beach	38,817	45,570	6,753
Montebello	5,898	5,009	*889
Montebello-West End	19,421	15,289	*4,133
Playa del Rey	3,933	4,159	226
Richfield	7,078	8,756	1,678
Rosecrans-Athens	8,101	9,868	1,767
Santa Fe Springs	23,941	26,610	2,669
Torrance	5,041	4,838	*203
Torrance "34" and "D & B"	6,303	6,608	305
Wilmington	79,061	83,429	4,368
Other Fields	4,011	4,835	824
TOTAL	284,306	301,135	16,829
STATE TOTAL	587,673	620,705	33,032

*—Shortage.